Depression and Overgeneral Memory in Older Adults: The role of Executive Functioning

And Clinical Research Portfolio

Volume I

(Volume II bound separately)

Deirdre Burns

(BSc Hons, MSc)

Mental Health and Wellbeing
University of Glasgow
1st Floor, Admin Building
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow G12 0XH

September 2014

Submitted in partial fulfilment of the requirement for the degree of Doctorate in Clinical Psychology (DClinPsy)

Acknowledgements

Firstly, my sincere thanks to all the people who gave their time to take part in this study. Thank you to my supervisors, Professor Kate Davidson and Dr. Clive Ferenbach, for your much appreciated support, guidance and time. Thank you to all the NHS staff who helped in the recruitment stages of this project, with special thanks to the Psychology Therapies for Older People Team in Lanarkshire. Thank you to my family and friends, who have supported me in more ways than they know, especially my father. To Stephen, for your patience, understanding and unwavering belief and support throughout these last 3 years. Finally, to my beautiful daughter Niamh for the gift of perspective and making me laugh everyday.

University of Glasgow

Declaration of Originality Form

This form **must** be completed and signed and submitted with all assignments.
Please complete the information below (using BLOCK CAPITALS).

Name	DEIRDRE BURNS
Student Number	0207380
Course Name	DOCTORATE IN CLINICAL PSYCHOLOGY
Assignment Number/Name	CLINICAL RESEARCH PORTFOLIO

An extract from the University's Statement on Plagiarism is provided overleaf. Please read carefully THEN read and sign the declaration below.

I confirm that this assignment is my own work and that I have:	
Read and understood the guidance on plagiarism in the Doctorate in Clinical Psychology Programme Handbook, including the University of Glasgow Statement on Plagiarism	X
Clearly referenced, in both the text and the bibliography or references, **all sources** used in the work	X
Fully referenced (including page numbers) and used inverted commas for **all text quoted** from books, journals, web etc. (Please check the section on referencing in the 'Guide to Writing Essays & Reports' appendix of the Graduate School Research Training Programme handbook.)	X
Provided the sources for all tables, figures, data etc. that are not my own work	X
Not made use of the work of any other student(s) past or present without acknowledgement. This includes any of my own work, that has been previously, or concurrently, submitted for assessment, either at this or any other educational institution, including school (see overleaf at 31.2)	X
Not sought or used the services of any professional agencies to produce this work	X
In addition, I understand that any false claim in respect of this work will result in disciplinary action in accordance with University regulations	X

DECLARATION:
I am aware of and understand the University's policy on plagiarism and I certify that this assignment is my own work**,** except where indicated by referencing, and that I have followed the good academic practices noted above
Signature.....Date.....
.....

CONTENTS

Chapter 1: Systematic Review

A Systematic Review of Executive Functioning in Depressed Older Adults

Deirdre Burns*

Written according to guidelines for submission
to the Journal of Clinical and Experimental Neuropsychology
(see Appendix 1)

*Address for correspondence:
Mental Health and Wellbeing
Academic Centre
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow, G12 0XH
Tel: 0141 211 3927

Submitted in partial fulfillment of the requirement for the degree of Doctorate in Clinical Psychology (DClinPsy)

ABSTRACT

Background: There is evidence to suggest that, within an adult population, deficits in executive functioning co-exist with depression. However, due to a lack of comprehensive literature reviews it is currently unclear whether a similar link exists between executive functioning deficits and depression within the older adult population.

Aims: This paper systematically reviews the current evidence regarding executive functioning (EF) abilities and depression in adults aged over 65 years of age.

Methods: A systematic search of electronic databases was conducted against set eligibility criteria. The reference lists of eligible papers were also manually searched. A quality appraisal checklist was developed and applied to the included articles. Eight articles met the eligibility criteria.

Results: Evidence was found for both the 'shifting' and 'inhibition' facets of EF (as proposed by Miyake et al, 2000) being associated with depression in older adults. However these findings were not unanimous across all studies in this review. The small number of studies included in this review, differences in the quality of these studies and differences in performance between specific neuropsychological tests could explain this mixed picture. No studies investigated the 'updating' facet of executive functioning. Phonemic verbal fluency and processing speed were both found not to differ between depressed and non-depressed individuals.

Conclusions: Shifting was found to be related to depression in older adults, dependent on type of neuropsychological test used. Indications point towards a link between inhibition and depression however limited conclusions can be drawn due to the lack of studies investigating this. Updating was not investigated by any study. Overall, this review points to a lack of research within this area. Further research is needed to clarify the relationships between EF and depression within older adult populations. Methodological factors such as small samples, lack of power, and task impurity could have impacted on the findings in these studies.

Contents Page

Figures and Tables

1. INTRODUCTION

Numerous studies have investigated the relationship between depression and cognitive impairment. Executive Dysfunction (deficits in the cognitive domain of Executive Functioning) is one such cognitive impairment. Executive Functioning (EF) has been defined in many ways but the common theme is that it encompasses the higher level cognitive processes that control and regulate lower level cognitive processes, and purposefully guide goal-orientated behaviour. EF abilities such as decision making, planning and prioritisation allow individuals to respond flexibly to the world around them, especially in novel situations. Impairment of EF can therefore have huge implications for abilities of daily living.

EF deficits, or Executive Dysfunction has been widely researched within the adult population and there is evidence to suggest that EF deficits co-exist with depression (Elderkin-Thompson, Mintz, Haroon, Lavretsky and Kumar, 2007, see Synder, 2013 for a review). Research investigating this link in older adult populations has found that depressed older people have greater executive functioning deficits than non-depressed older adults (Butters, et al., 2004; Nebes et al., 2000; Rapp et al., 2005), and greater EF deficits than depressed younger adults (Fossati, Coyette, Ergis and Allilaire, 2002). However findings have been somewhat mixed with some studies failing to replicate findings of previous research (e.g. Mackin and Arean, 2009, found no EF deficits in depressed older adults). Compared to studies involving adult populations; there are notably fewer studies investigating the link between EF deficits and depression in older adults.

There are many literature reviews of cognition and depression indicating that depressed individuals have a multitude of cognitive deficits that are not present in the non-depressed population. (Adult: Ottowitz, Dougherty and Savage, 2002; Hammar and Ardal, 2009; Lee, Hermens, Porter and Redoblado-Hodge, 2012 – for a meta-analysis, and older adult : Thomas and O'Brien, 2008; Steffens and Potter, 2008). However, few of these reviews have been systematic reviews or had a specific EF focus. An exception is the work of Snyder (2013) which involved a comprehensive meta-analysis and review of EF and Major Depressive Disorder (MDD) covering over 100 research studies. It found that MDD is reliably associated with impaired performance on neuropsychological measures of EF (effect sizes ranging from d = 0.32 to 0.97). Usefully, Snyder (2013) used the Miyake, Friedman, Emerson and Howerter (2000) model (a commonly used model of EF) that divides EF into three distinct sub-categories (Shifting, Inhibition and Updating – see section 2 for definitions). Although linked, these sub-categories can be thought of and (crucially) measured separately. In Snyder's (2013) review the mean age of participants in the included studies was 46 years. Few studies included participants who would be considered older adults in a clinical setting (i.e. over 65 years of age).

The link between EF and depression in older adults is clinically relevant as it has been found that those individuals with depression with executive dysfunction have greater functional disability (Alexopoulos et al., 1997; Butters et al., 2004) and poorer treatment response to antidepressants (Dunkin et al., 2000; Baldwin et al., 2005).

1.1 Definitions of EF and Older Adult

An inherent difficulty in all EF research has been how exactly to define EF and consequently how to measure it. EF, as a higher-arching set of cognitive abilities, is difficult to extract from other cognitive processes (e.g. memory), in order to measure 'pure' EF. Researchers often use different neuropsychological tasks to measure aspects of EF. This makes comparison between studies difficult.

Determining who constitutes an 'older adult' also requires consideration. Age-related cognitive decline is highly prevalent within non-clinical populations, as is damage to the frontostriatal circuitry in older adults, an area thought to be responsible - at least in part - for EF (Kramer, Humphrey, Larish, Logan and Strayer, 1994; Turner and Spreng, 2012).

The age range of study participants in studies that investigate EF and depression in older adults is very wide. The term 'older adult' has been applied to individuals aged from mid 50's (Sairs, Welsh-Bohmer, Wagner and Steffens, 2006; Baudic, Tzortzis, Barba and Traykov, 2004) to those over 70 years of age (Liu et al, 2012 ; Eggermont, Milberg, Lipsitz, Scherder and Leveille, 2009). Given what is known about how EF deficits increase with age (Turner and Spreng, 2012), it is difficult to draw any firm conclusions from the literature about the relationship between executive functioning and depression specifically in older adults without proper consideration of age ranges. Although many studies attempt to control for age (including age as a covariate), it is still unclear how representative their findings are of clients attending for mental health treatment in UK older adult services who often only see clients aged 65 years and upwards.

2. AIMS OF THE REVIEW

This systematic review aims to collate and analyse the research that investigates EF and depression specifically in older people. It will be the first review in this area to critically assess the *quality* of the evidence in available literature alongside a summary of study findings.

Following on from Snyder (2013), the available literature will be discussed in terms of Miyake's et al. (2000) model which separates EF into three distinct subcategories:

- *Inhibition* - the ability to deliberately inhibit dominant, automatic or pre-potent responses when necessary.
- *Shifting* – the ability to shift back and forth between multiple tasks, operations or mental sets.
- *Updating* – the updating and monitoring of working memory representations.

The standard age range for Older People's health services (including mental health) in Scotland/UK is 65 years and over. Therefore a participant age minimum age limit of 65 years will be applied to allow conclusions to be of greater clinical significance.

The main aim of this review is to summarize the evidence and critique the literature that investigates EF in depressed older adults. This review attempts to answer the following questions:

1. Of what quality are the studies that comprise the available literature on depression and EF in older adults?
2. Do depressed older adults exhibit more executive functioning deficits than non-depressed older adults? If so, are the deficits more pronounced in some sub-categories of EF than others?

3. METHODOLOGY

The methods used for the undertaking and reporting of this systematic review are based on guidance outlined by the Centre for Reviews and Dissemination (2009) and the PRISMA statement (Moher, Liberati, Tetzlaff and Altman, 2009; Liberati et al., 2009)

3.1 Search Strategy

A systematic search of electronic databases was conducted. The following databases were searched to identify studies: Medline and Embase (via OVID online); PsychInfo (via EBSCOhost); Web of Science (via Web of Knowledge) and the Psychology & Behavioral Sciences Collection.

The following search terms were used, both as key words and as subject headings, creating two search strings (using the Boolean operator 'OR' to combine searches within strings).

- Executive function* 'OR' Cognitive Impair*
- Depressive Disorder 'OR' Major Depressi* 'OR' MDD (Initially the search term Depress* was included in this search string. However due to the volume of returned articles exceeding 8'000 it was decided to remove this term due to time and resource limitations)

The two search strings were then combined using the Boolean operator 'AND' to produce the final output. Searches were limited to those published in English with human subjects. A minimum age limit of 65 years was applied in those databases where this was available. No date limitation was applied. All database searches were carried out on 21st January 2014. Hand searches were also carried out on reference lists of selected papers and also on a recent relevant meta-analysis (Synder, 2013).

The title and abstract of each paper identified from the search was screened for suitability according to inclusion and exclusion criteria with full text papers being sought for suitable articles. Full text was also obtained when suitability could not be determined from the review of the title and abstract alone.

3.2 Inclusion and Exclusion criteria

Inclusion criteria

- Participants aged 65 and above with Depression
- Control group aged 65 and above without Depression
- Outcome measures include at least one recognised test of executive function

Exclusion criteria

- Diagnosed Mild Cognitive Impairment, Dementia or use of cognitive enhancer medication

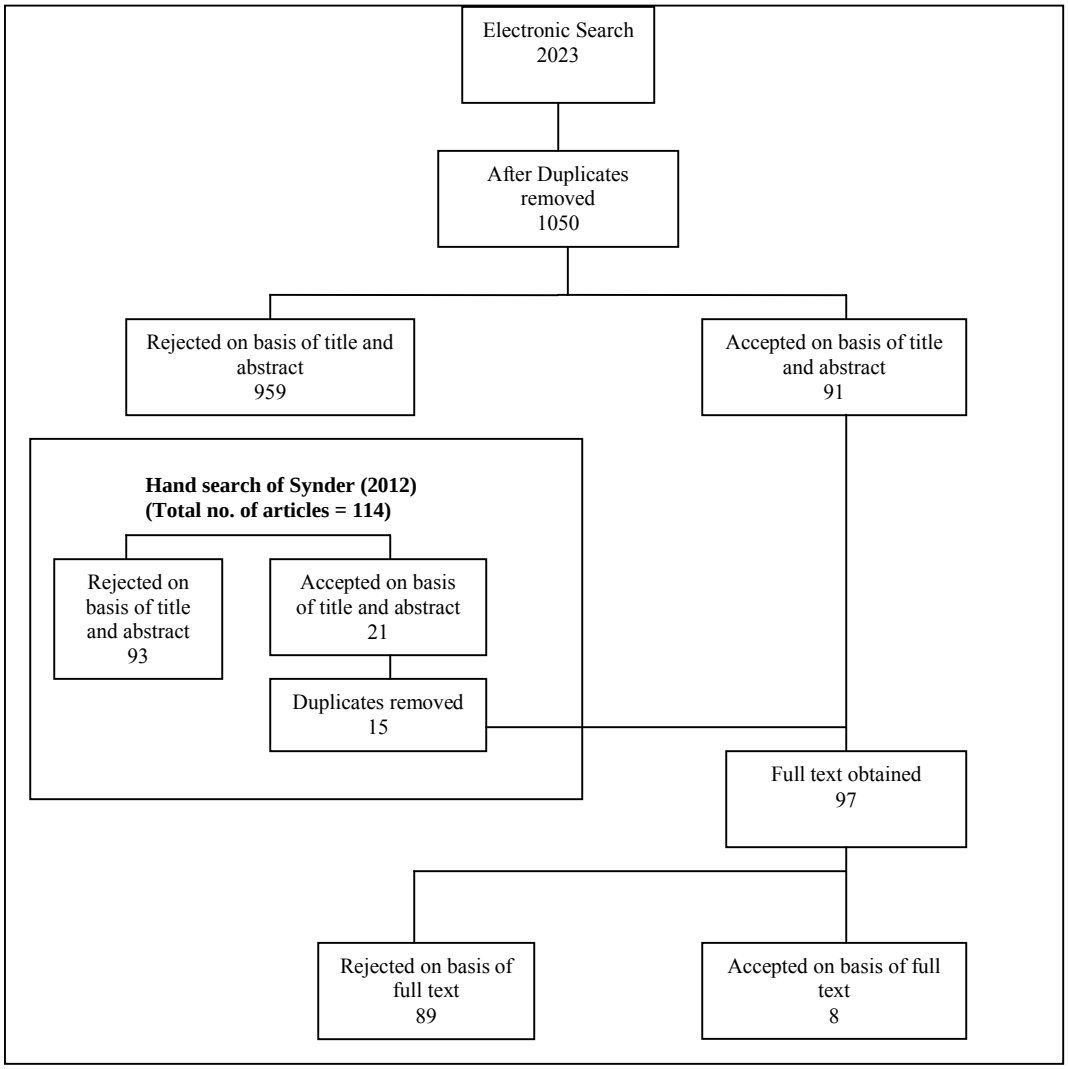
- Participants aged under 65 years of age
- Participants with remitted Depression
- Participants included those who have suffered from head injury, Stroke, Parkinson's Disease.
- Single case studies
- No clearly defined control group

Where eligibility for inclusion remained unclear, another researcher also reviewed the full article, and agreement was reached through discussion.

3.3 Selection process

Electronic searches returned 2023 results, which was reduced to 1050 once duplicate articles were removed. These 1050 were examined, along with the 114 identified in the Synder review (2013), according to the inclusion and exclusion criteria, giving a total of 1164. Of this total, 1067 articles were rejected on the basis of title and abstract alone. The remaining 97 had full text obtained after which 8 of these met criteria for inclusion. These articles were hand searched for potential eligible articles and 16 full text articles were sought, of which none were eligible for inclusion. Therefore, the final number of studies found to be eligible for inclusion in this review was 8. The selection process is illustrated in Figure 1.

Figure 1. Flow diagram of selection process for papers included in systematic review



3.4 Quality evaluation

As per the PRISMA Statement (Moher et al., 2009; Liberati et al., 2009), quality evaluation criteria were utilised to evaluate the methodological quality of studies in this review. A quality appraisal checklist that assessed key methodological components (see Appendix 2.2) was developed specifically for this review. Its content was based on

existing frameworks, including the Clinical Trials Assessment Measure (CTAM; Tarrier & Wykes, 2004). The checklist included information on the methodology and design of the study; the selection of participants; the assessment of EF and data analysis.

As recommended by the Centre for Reviews and Dissemination (2009) the checklist was piloted on a random selection of the articles (n=3) and adjustments made accordingly. An independent rater reviewed the quality rating of 75% of the included papers. Inter-rater agreement was high with raters agreeing on 90% of scoring items. This increased to 96% following discussion. The final quality appraisal checklist included 24 items, yielding a total score of 40. Scores were converted to percentages and categorised to allow for comparison, as follows: Poor Quality (>50%); Acceptable Quality (51-60%); Good Quality (61-70%); Excellent Quality (71-80%); and Exceptional Quality (81+%).

4. QUALITY OF STUDIES

(Aim 1)

The quality of the studies (as measured by the specially devised Quality Rating Scale – see Appendix 2.2) included in this review ranged from 'Excellent' to 'Acceptable.' Three studies were classified as of 'Acceptable' quality (Rainer et al, 2006, Mackin et al, 2009, and Kramer-Ginsberg et al, 1999), with a further three studies classified as of 'Good' quality (Reppermund et al, 2011; Ganguli et al, 2006; Schoepflin-Sanders et al, 2006), see Table 1. Two studies were assessed to be of excellent quality (Liu et al, 2012; Richard-Devantay, 2012).

Table 1. also highlights the strengths and weaknesses of each study as determined by the four key areas assessed by the Quality Rating Scale.

4.1 Quality Rating Scale

4.1.1 Selection of Sample

Most studies recruited their study sample by convenience sampling which introduces an element of bias into the study. However, of note, two studies used a geographic method of sampling in selecting their participants (Rainer et al., 2006; Reppermund et al., 2011), which removes the selection bias of convience sampling. Studies who scored highly in this area utilised clinician rating scales for assessment of depression (e.g. Schoepflin-Sanders et al., 2006) rather than rely on self report methods (Ganguli et al., 2006). All but one study (Schoepflin-Sanders et al., 2006) were clear on their inclusion and exclusion criteria for their study, allowing the reader to replicate the study and understand the limits of generalisation of the findings.

Studies with the lowest scores in this area did not control for comorbidity of other psychiatric disorders, for example anxiety (Ganguli et al., 2006; Mackin et al., 2009; Schoepflin-Sanders et al., 2006). In addition both Mackin et al. (2009) and Schoepflin-Sanders et al. (2006) did not report whether or not their participant sample was taking any psychiatric medication. By not controlling for comorbidity and medication use, any findings could be the results of these confounding variables and not a true interaction of depression and EF.

4.1.2 Assessment of Executive Functioning

All studies used appropriately reliable and validated EF tests. Studies that scored highest in this area (Richard-Devantay et al., 2012; Ganguli et al., 2006) ensured that the individuals administering and scoring the neuropsychological tests were blinded to which group a participant belonged to (ie. depressed or control groups). This helps to eliminate clinician bias. Studies (for example, Reppermund et al., 2011; Liu et al., 2012) also scored well if they included an appropriate neuropsychological control task (such as Trail A – measure of psychomotor speed). Such tasks help to reduce a known confounding variable in neuropsychological testing (for further detail see section 5.4.2).

The majority of the studies used only one neuropsychological task to measure a certain aspect of EF. For example, when investigating 'shifting' ability, only Trail B was administered to the participants (as in Reppermund et al, 2011; Ganguli et al, 2006; Schoepflin-Sanders et al, 2006; Rainer et al, 2006). This can lead to task impurity whereby true associations can be missed by only using one neuropsychological task. This is due to tasks measuring EF inherently operating on other cognitive processes (e.g. Trail B, although designed to measure switching between mental sets, also relies on visual processing). Therefore deficits shown on one task might not necessarily be due to an EF deficit, but may instead be due to a deficit in another cognitive process necessary to carry out that task. If multiple tests tapping into the same EF ability are used then this can help address this problem. In this review, only three studies carried out multiple tasks per EF ability: Richard-Devantay (2012) for inhibition and Liu et al (2012) and Mackin et al (2009) for switching.

4.1.3 Methodology and Design

Studies who scored well in this area (Ganguli et al., 2006; Liu et al., 2012) utilised a non-clinical comparison group (healthy control group). Another strength of some of the studies was considering key demographics and either matching the groups by these (e.g. gender, age etc) or making allowances for significant demographic differences between the groups in their analysis (Rainer et al., 2006; Liu et al., 2012). Of note, a few studies (Mackin et al., 2009; Rainer et al., 2006; Reppermund et al., 2011) did not control for general cognitive functioning in their study, for example by administering the Mini Mental State Exam (Folstein, Folstein, and McHugh, 1975) or the Addenbrookes Cognitive Examination (Mioshi, Dawson, Mitchell, Arnold, and Hodges, 2006). General cognitive functioning is impaired in Mild Cognitive Impairment and diseases such as dementia. Without assessing for this there is the possibility that deficits in EF could be representative of a wider cognitive deficit and not necessarily of depression.

4.1.4 Data Analysis

All studies carried out appropriate statistical analysis of their data, however all but one study (Ganguli et al., 2006) failed to report data on those potential participants who declined to participate in the study, or those participants who dropped out of the study prior to completion. It is therefore unclear if the findings in these studies are representative of the sample as a whole. In addition those studies who scored lower in this area reported their results poorly, in terms of reporting confidence intervals, p-values etc. (Reppermund et al., 2011; Mackin et al., 2009).

Table 1. Quality ratings and description of strengths and weaknesses of the studies reviewed.

	Lui et al . (2012)	**Richard-Devantay et al. (2012)**	**Ganguli et al. (2006)**	**Schoepflin-Sanders et al. (2006)**
Total Quality Score	Excellent – 73%	Excellent – 70%	Good - 65%	Good – 65%
Selection of Sample (max 15)	11/15 Strengths: clear inclusion/exclusion criteria, reported medication use, comorbididity controlled for Weaknesses: no data on non-participants	11/15 Strengths: clear inclusion/exclusion criteria, , clinician assessed for depression. Weaknesses: no data on non-participants	8/15 Strengths: Clear inclusion/exclusion criteria Weaknesses: No data on non-participants, comorbidity not controlled for, no report of depression severity	9/15 Strengths: Clear inclusion/exclusion criteria, clinician assess for depression Weaknesses: No description of recruitment method used, comorbidity not controlled for, no data on medication usage.
Assessment of EF (max 9)	6/9 Strengths: appropriate control task used, good description of EF tests, Weaknesses: single NP measures used per EF, no blinding of NP assessors	7/9 Strengths: Multiple NP measure used per EF, appropriate control task used, NP assessors blinded to group Weaknesses: No description of EF tests	6/9 Strengths: Assessors 'blinded' re depression status, appropriate control task used Weaknesses: single NP measures used per EF	6/9 Strengths: appropriate control task used, clear description of EF tests. Weaknesses: no blinding of NP assessors, single NP measures used per EF ability.
Methodology and Design (max 11)	9/11 Strengths: Non-clinical comparison group, matching of depressed and control group by demographics, controlled for GCF Weaknesses: Power not reported	7/11 Strengths: Non-clinical comparison group, controlled for GCF. Weaknesses: Power not reported	8/11 Strengths: Non-clinical comparison group Weaknesses: Power not reported	8/11 Strengths: Non-clinical comparison group, controlled for GCF. Weaknesses: Power not reported.
Data Analysis (max 5)	3/5 Strengths: Appropriate analysis Weaknesses: No data on dropouts	3/5 Strengths: Appropriate analysis Weaknesses: No data on dropouts	4/5 Strengths: Appropriate analysis and data on dropouts provided.	3/5 Strengths: Appropriate analysis Weaknesses: No data on dropouts.

Table 1 (continued). Quality ratings and description of strengths and weaknesses of the studies

	Reppermund et al (2011)	**Mackin et al. (2009)**	**Kramer-Ginsberg et al. (1999)**	**Rainer et al. (2006)**
Total Quality Score	Good – 63%	Acceptable – 58%	Acceptable - 55%	Acceptable – 53%
Selection of Sample (max 15)	11/15 Strengths: Clear inclusion/exclusion criteria, use of geographic sampling. Weaknesses: No data on non-participants, no data on medication use	7/15 Strengths: Clear inclusion/exclusion criteria, clinician assess for depression Weaknesses: No description of recruitment method used, comorbitidy not controlled for, no data on medication usage.	10/15 Strengths: Clear inclusion/exclusion criteria, clinician assessed for depression Weaknesses: No data on non-participants, no data on medication use	11/15 Strengths: Clear inclusion/exclusion criteria, use of geographic sampling, clinician assessed for depression. Weaknesses: No data on non-participants, comorbidity not controlled for.
Assessment of EF (max 9)	6/9 Strengths: multiple NP measures used per EF, control task used. Weaknesses: no blinding of assessors of NP tests, poor description of EF tests.	8/9 Strengths: multiple NP measures used per EF, appropriate control task used, clear description of EF tests. Weaknesses: no blinding of NP assessors	2/9 Weaknesses: single NP measures used per EF, no blinding of assessors of NP tests, no control task used.	1/9 Weaknesses: Assessors of NP not 'blinded' re depression status, no appropriate control task used, single NP measures used per EF, no description of EF tests.
Methodology and Design (max 11)	6/11 Strengths: Non-clinical comparison group, Weaknesses: Power not reported, did not control for GCF	6/11 Strengths: matching of depressed and control group by demographics Weaknesses: Power not reported, did not control for GCF	7/11 Strengths: Non-clinical comparison group, matching of depressed and control group by demographics Weaknesses: Power not reported, did not control for GCF	6/11 Strengths: matching of depressed and control group by demographics. Weaknesses: Power not reporte, did not control of GCF
Data Analysis (max 5)	2/5 Strengths: Appropriate analysis Weaknesses: No data on dropouts, poor reporting of CI, P-values etc.	2/5 Strengths: Appropriate analysis Weaknesses: No data on dropouts, poor reporting of CI, P-values etc.	3/5 Strengths: Appropriate analysis Weaknesses: No data on dropouts.	3/5 Strengths: Appropriate analysis Weaknesses: no data on dropouts provided.

(EF – Executive Functioning; CI – Confidence intervals; GCF – Global cognitive functioning; NP – neuropsychological)

5. RESULTS AND DISCUSSION

5.1 Study characteristics (see Table 2)

5.1.1 Age and Gender

The total number of participants included in the studies was 3190, which comprised 551 depressed and 2639 control participants The mean age of all the participants in the studies was 75.8 years of age. The mean age of the depressed participants was 76.4 and ranged from 81.2 years (Liu et al, 2012) to 74.0 years (Schoepflin-Sanders, Lyness, Eberly, King and Caine, 2006). The mean age of the control participants was 75.2 and ranged from 81.4 years (Liu et al, 2012) to 72.8 years (Kramer-Ginsberg et al, 1999). Information on the gender of participants was provided by all studies. With the exception of one study which included only men (Liu et al, 2012), all studies included more women than men, with the percentage of women ranging from 54.6% (Ganguli, Du, Dodge, Ratcliff, and Chang, 2006) to 67% (Rainer et al, 2006).

5.1.2 Populations

Three studies recruited participants from mental health care settings (community, Kramer-Ginsberg et al, 1999; Mackin et al, 2009, and inpatient Richard-Devantay et al, 2012). One study recruited from primary care (Schoepflin-Sanders et al, 2006), and one study recruited from a supported living accommodation facility (Liu et al, 2012). The remaining three recruited from community populations (Reppermund et al, 2011; Ganguli et al, 2006; Rainer et al, 2006).

5.1.3 Measurement and severity of depression

Four studies (Kramer-Ginsberg et al, 1999; Schoepflin-Sanders et al, 2006; Mackin et al, 2009; Richard-Devantay et al, 2012) utilized both clinician and self report measures of depression. Three

studies measured depression by self report measures (Liu et al, 2012; Reppermund et al, 2011; Ganguli et al, 2006), and one study assessed depression by clinician assessment alone (Rainer et al, 2006). The most common method used by clinicians to determine the presence or absence of depression was to use the Diagnostic and Statistical Manual, 4th Edition (DSM-IV – four studies), followed by the Structured Clinical Interview for DSM-III-R (SCID, Spitzer, 1992 - two studies). The most common self report measure used was the Hamilton Depression Rating Scale (HDRS, Williams, 1988, - five studies) followed by the Geriatric Depression Scale (GDS, Sheikh and Yesavage, 1986 - two studies).

Severity of depression was reported in seven studies. Two studies reported the number of participants with Major Depressive Disorder over Minor depressive disorder (Schoepflin-Sanders et al, 2006 – 44%; Rainer et al, 2006 – 45%). One study had inclusion criteria that allowed only those with MDD to participate (Mackin et al, 2009). Of the five studies that used the HDRS, the mean score was 24.4 indicating severity in the 'very severe' range. Only one of the two studies that used the GDS reported scores for severity, Liu et al, 2012 reported an average GDS score of 7.5, indicating symptoms within the 'normal' range. History of, and duration of depression were reported in only one study (Richard-Devantay et al, 2012), where 50% of depressed participants had a psychiatric history of depressive disorder and 38% of participants had two or more previous depressive episodes.

5.1.4 Medication

Medication use was reported in three studies (Reppermund et al, 2011; Ganguli et al, 2006; Rainer et al, 2006) where the percentage of depressed participants using antidepressant or benzodiazepine medication was reported as 35%, 22% and 35% respectively. Mackin et al (2009) excluded those that were taking medication from their study. In contrast, depressed participants in Liu et al (2012) and Richard-Devantay et al (2012) were all given some form of medication (antidepressants and/or benzodiazepines) on entry to the study.

Table 2. Main characteristics of studies reviewed.

Study	Population/ recruitment	Gender (female)	No of participants		Mean Age (SD)		Depression measure	Medication use
			D	C	D	C		
Liu et al. (2012) Executive functions in elderly men	Chinese male war veterans aged 75 years old and upwards living in supported accommodation	0%	133	45	81.2 (3.98)	81.4 (3.89)	GDS	100%
Reppermund et al. (2011) The relationships of current and past depressive symptoms with cognitive impairment and activities of daily living in elderly population	Community dwelling older people aged 70-90 years of age in Australia	57%	49	751	N/A	N/A	mCES-D	35%
Ganguli et al. (2006) Depressive symptoms and cognitive decline in late life: a prospective epidemiological study.	Community dwelling older people over 65 years of age American voters and volunteers	55%	128	1137	75.8 (5.5)	74.5 (5.1)	Ham-D SCID	22 %
Kramer-Ginsberg et al. (1999) Neuropsychological functioning and MRI signal hyperintensities in geriatric depression	Patients at geriatric psychiatry service (inpatient, and outpatients) and volunteers from community	62%	41	38	74.0 (6.2)	72.8 (6.4)	Ham-D SCID	N/A
Schoepflin-Sanders et al. (2006) Cerebrovascular risk factors, executive dysfunction and depression in older primary care patients.	American 65 years of age and over presenting for care at their local primary care clinic	60%	24	394	74.0 (6.2)	74.7 (6.6)	Ham-D DSM-IV	0%
Mackin et al. (2009) Impaired financial capacity in late life depression is associated with cognitive performance on measures of executive functioning and attention.	American adults over the age of 65 recruited via media and financially remunerated for participation.	66%	65	32	N/A	N/A	Ham-D DSM-IV	0%
Richard-Devantay et al. (2012) Deficits of cognitive inhibition in depressed elderly: a neurocognitive marker of suicidal risk	French adults over the age of 65 – psychiatric inpatients and a control group of community dwellers	63%	40	20	76.5 (7.0)	75.2 (3.4)	DSM-IV	100%
Rainer et al. (2006) Data from the VITA study do not support concept of vascular depression	Austrian community dwelling adult volunteers aged between 75-76 years of age.	67%	51	204	N/A	N/A	DSM-IV	35%

(N/A – data not available; SD – Standard deviation; D – Depressed group; C – Control group; GDS – Geriatric Depression Scale; DSM-IV – Diagnostic and Statistical Manual -IV; Ham-D – Hamilton Depression Rating Scale; SCID – Structured Clinical Interview for Depression; mCES-D – modified Centre for Epidemiological Studies – Depression Scale)

5.2 Sample Size and Effect Size

Of note, no study included in this review reported effect sizes. However, for those studies where the data was available (i.e. mean and standard deviation of both depressed and non-depressed groups),

this data was extracted and effect size calculations (Cohen's D, Cohen, 1992) completed (see Table 3). Only two studies (Liu et al, 2012; Ganguli et al, 2006) had sample sizes large enough to detect relationships with small effect sizes (Cohen, 1992). One study (Mackin et al, 2009) had a sample size large enough to detect medium effect sizes and the remainder only for large effect sizes. Therefore it is possible that studies in this review reporting null results may have simply been underpowered. This would mean the study was unable to detect more realistic small or moderate effect sizes. In addition, none of the included studies reported that they based their sample size on a power calculation.

5.3 Executive Functioning (Aim 2)

The total number of executive functioning tests employed within individual studies was wide ranging, from one test (Ganguli et al, 2006) to seven tests (Richard-Devantay, 2012). All studies with the exception of one, Kramer-Ginsberg et al (1999), investigated at least one of the components of EF as outlined by Miyake et al.'s (2000) model (see Table 3).

5.3.1 Shifting

The most investigated component of Miyake et al.'s (2000) model of EF was 'shifting'. Shifting was investigated by seven studies (Liu et al, 2012; Reppermund et al, 2011; Ganguli et al, 2006; Schoepflin-Sanders et al, 2006; Mackin et al, 2009; Richard-Devantay, 2012; Rainer et al, 2006). All of these studies used Trail B from the Trail Making Task (TMT) to ascertain participants' shifting abilities, with two studies also utilising the Wisconson Card Sort Test (WCST, Spitzer et al., 1992), and one study (Richard-Devantay, 2012) using the Rule Shift Card test (Alderman, Burgess, Emslie, Evans and Wilson, 2003).

5.3.1.1 Trail making task

The TMT of which there are two parts – parts A and B, has widely been used as a measure of executive functioning (e.g Rapp et al., 2005; Butters et al., 2004). It is a visuomotor task that requires the participant to firstly connect numbered circles in sequential order with a drawn line (Trail A), and then, to alternate between connecting numbers and letters sequentially with a drawn line (Trail B). Trail B thus requires the participant to shift or switch between mental sets (in this case between letter and number sequences). The outcome measure is usually the time taken to complete the test in seconds.

The time in seconds for completion of Trial B was the most common outcome measure, utilized by Liu et al (2012); Schoepflin-Sanders et al (2006); Mackin et al (2009), Richard-Devantay (2012); Rainer et al (2006). The studies reported mixed results, with Richard-Devantay (2012) and Rainer et al (2006) reporting that depressed participants took significantly longer to complete the task than non-depressed controls. Whilst Liu et al (2012) and Mackin et al (2009) did not find such an association. Schoepflin-Sanders et al (2006) found that whilst depressed individuals took significantly longer to complete Trail B than healthy controls, this association was not significant after subjects with a MMSE <25 were excluded from the analysis.

Richard-Devantay (2012) also investigated the number of errors participants made in completing Trail B and found that it was significantly associated with depression status. Ganguli et al (2006) used the number of correct connections per second as their outcome measure, which incorporates both time to complete and errors data, and found it was significantly associated with depression status. Reppermund et al (2011) reported a significant difference between depressed and non-depressed participants, although this difference was no longer significant when controlling for the effect anxiety.

Reppermund et al (2011) also reported that those with a history of depression performed significantly worse on EF tests than those without previous episodes, and interestingly this association held even

when controlling for the effect of anxiety. This study however failed to report individual results for Trail B, instead grouping this and the other EF test completed (Controlled Oral Word Association Test, COWAT, Benton, Hasher, and Sivan, 1983) together, making it unclear how much of this association can be solely attributed to the participants performance on Trial B.

As the TMT also loads on visual search and motor speed, it has been suggested (Schoepflin-Sanders et al, 2006) that Trail A scores should be used in conjunction with Trail B scores to minimize these confounding effects, giving a 'purer' EF (e.g. shifting) score. For example, subtracting Trail A completion time away from Trail B completion time, would give a clearer indication of 'shifting' abilities, as only Trail B utilizes this ability. However, surprisingly, only one of the studies employed this technique (Schoepflin-Sanders et al, 2006).

5.3.1.2 Wisconsin Card Sort Test

The WCST is another widely used test of executive functioning. Participants are required to sort cards into 4 different piles according to an unspoken rule. They receive feedback after placing each card which should guide them to discovering the rule in place and correctly place subsequent cards. The rule changes numerous times throughout the test and participants are required to reassess where to place the cards based on the feedback they are given. In this way, the WCST is a measure of cognitive flexibility and switching between cognitive sets. Two studies used this measure, Mackin et al (2009 - in addition to Trials B) and Liu et al (2012). Both studies used 'total number of errors' as their outcome measure for the WCST. Liu et al (2012) found that depressed older men performed significantly worse than non-depressed older men on the WCST. However, Mackin et al (2009) did not find such an association. Richard-Devantay (2012) used a variation of the WCST, the Rule Shift Cards test from the Behavioural Assessment of Dysexecutive Syndrome test battery (Alderman et al., 2003). They found that depressed older adults showed deficits in this test over their non-depressed counterparts as measured by time taken to complete the test and number of errors.

5.3.1.3 Summary of 'shifting'

In summary, the results of the studies examined presented a mixed picture in relation to shifting ability and depression in older adults. This is reflective of past research in other client groups (eg. Ottowitz et al, 2002). The studies that did find a significant difference in older depressed adults 'shifting' abilities compared to their non-depressed counterparts (Ganguli et al, 2006, Richard-Devantay, 2012, Rainer et al, 2006 and Liu et al, 2012) reported effect sizes that ranged from moderate (Ganguli et al, 2006 – d = 0.42) to very large (Richard-Devantay, 2012 – d = 1.74) (see Table 2). The quality of the studies reporting on 'shifting' was variable, with the studies that did find a relationship being of higher quality. This might explain some of the difference in results between studies. Also of note, there was more discrepancy between studies for the Trails B test than for the WCST, with the latter also reporting larger effect sizes (large to very large effect sizes , compared to moderate effect sizes for Trails B). Ottowitz et al (2002) suggested that this may be due to the fact that Trail B may be a less demanding test of executive function than other tests such as the WCST and therefore a less sensitive test of cognitive impairments, especially in mildly depressed patients.

Table 3. Summary of the findings of studies reviewed: Executive functioning tests/Processing speed and their relationship with depression.

Study	Executive Functioning Tests			Processing speed
	Shifting	Inhibition	Verbal Fluency	
Ganguli et al. (2006)	*Trail B (d = 0.47)	-	-	*Trail A (d = 0.43)
Kramer-Ginsberg et al. (1999)	-	-	COWAT (d = 0.48)	-
Liu et al (2012)	*WCST (d = 0.80) Trail B (d = 0.32)	-	-	Trail A (d = 0.25)
Mackin et al. (2009)	WCST (d = 0.10) Trail B (d = 0.00)	Stroop (d = 0.42)	COWAT (d = 0.01)	-
Rainer et al. (2006)	*Trail B (d = 0.66)	-	*Verbal Fluency (d =0.61)	-
Reppermund et al. (2011)	*Trail B (DNA)	-	COWAT (DNA)	Trail A (DNA)
Richard-Devantay et al. (2012)	*RSC – time (d =1.15) *RSC – errors (d = 1.74) *Trail B (d = 1.92)	*Stroop (d = 1.23) *Go-No-Go test (d =0.91) *Halying (d = 2.85) *RWD (d = 1.04)	*Phonemic (d = 0.49) *Categorical (d = 1.17)	*Trail A (d = 0.40)
Schoepflin-Sanders et al. (2006)	*Trail B (d = 0.27)	-	-	Trail A (d = 0.27)

(* denotes significance at $p < 0.05$; WCST – Wisconsin Card Sort Test; Trail B – Trail B of the Trail Making Test; RSC – Rule Shift Card test; COWAT – Controlled Oral Word Association Test; RWD – Reading With Distraction test; d – Cohen's D effect size; DNA – data not available)

5.3.2 Inhibition

Inhibition was investigated by two studies (Mackin et al, 2009 and Richard-Devantay et al, 2012). Both of these studies used the Stroop test to measure inhibition. Richard-Devantay et al (2012) also used a further three measures as outlined below.

5.3.2.1 Stroop test

The Stroop test, originally developed by Stroop in 1935 is a cognitive interference task that evaluates the ability to inhibit over-learned responses. The participant is first required to read out loud names of colours written on a page. This is followed by presenting the participant with a second piece of card with a series of coloured squares printed on it and asking them to call out the colours of the squares they can see. The final part of the test involves the participant being presented with a further piece of paper on which a series of names of colours are printed in incongruent colours. The subject is required to name the colour of the ink. For example, if the word "red" was presented in blue ink, the correct answer would be "blue" and not "red" ("red" being the overlearned response).

Richard-Devantay et al (2012) found that depressed participants performed worse on both the interference score (d = 1.23 – very large) and errors (d = 0.63 – medium) of the Stroop test compared to control participants. Of interest, the interference score was only significant when comparing controls to suicidal depressed participants, and not with non-suicidal depressed participants. This indicates that suicidal depressed older adults took longer to complete the incongruent condition of the test than both controls and non-suicidal depressed older adults.

In contrast, Mackin et al (2009) found no differences in performance on the Stroop test (as measured by the number of correct responses) between those study participants with major depression and those without. In the Mackin et al (2009) study time taken to complete the test was not measured. Instead, the number of errors participants made during the test was used as the outcome measure. It could be that participants were indeed struggling with inhibiting initial responses in the test and therefore took

longer to respond correctly, which would have led to an increased time to complete the test, albeit without this being reflected in the error count.

Another point to bear in mind is that Mackin et al (2009) was rated as a lower quality study than Richard-Devantay et al (2012), due in part to the potential for bias in how participants were recruited (e.g. volunteers responding to media advertisement). Also, although both studies were investigating participants with MDD, Mackin et al (2009) did not report severity, whilst Richard-Devantay et al (2012) did, with all participants scoring in the 'very severe' range on Hamilton Depression Rating Scale, indicating that severity could also be a factor here.

5.3.2.2 Other neuropsychological tests measuring inhibition

As mentioned previously, Richard-Devantay et al (2012) looked at a number of neuropsychological tests that measure inhibition. In addition to the Stroop test, the study also employed the Hayling sentences completion test (Burgess and Shallice, 1997), the Go-No-Go test (Nosek and Banaji, 2001) and the Reading with Distraction (RWD, Connelly, Hasher and Zacks, 1991) test. Richard-Devantay (2012) found that depressed individuals performed worse on all of these tests of inhibition than controls, with large (Go-No-Go test, d = 0.91) to very large (RWD e.g. recall d = 1.39, Halying e.g. penalties d = 2.40) effect sizes reported.

5.3.2.3 Summary of inhibition

Overall very few studies included in this review investigated inhibition. As such, it is difficult to form solid conclusions about inhibition and depression in older adults. However, the indication is that there may be an association between deficits in ability to inhibit and depression in older adults. Further studies in this area are needed to confirm this. Also of note, the Richard-Devantay (2012) study, which found strong associations with deficits in inhibition and depression, obtained its depressed participants sample from those currently admitted to psychiatric inpatient wards. It also included participants who had recently attempted suicide. The relationship between inhibition and depression

highlighted might be reflective of the severe nature of their participant's depression at the time of testing. For example, the severity of their depressed group, as tested by the Hamilton Depression Rating Scale, was in the 'very severe' range.

5.3.3 Updating

Updating, as defined by Miyake et al. (2000), is the updating and monitoring of working memory representations. No study included in this review investigated 'updating' abilities. This is in keeping with the finding of Snyder (2013) that less than 9% of studies included in their large review (containing over 100 studies) investigated 'updating abilities'. However, Snyder (2013) did find that participants with major depressive disorder performed significantly worse on updating measures than healthy control participants (e.g. n-back test, d = 0.63), indicating that investigations in the older adult population are warranted.

5.4 Other cognitive abilities

Some studies investigated cognitive abilities that do not neatly fit into Miyake et al.'s (2000) model of EF but nonetheless have been widely considered as measures of EF.

5.4.1 Verbal fluency

Verbal fluency tests are widely used as tests of global executive functioning. These tests require participants to say as many words as possible from a certain category within a given time (usually 60 seconds). Semantic variants include categories such as animals or fruits, whilst phonemic variants require participants to name words beginning with a certain letter, for example F. Five of the studies included in this review (Reppermund et al, 2011; Kramer-Ginsberg et al, 1999; Mackin et al, 2009; Richard-Devantay, 2012; Rainer et al, 2006) investigated verbal fluency. The 3 studies (Reppermund et al, 2011; Kramer-Ginsberg et al, 1999; Mackin et al, 2009) that used a phonemic verbal fluency test (COWAT) did not find any association with performance on this task between depressed and

non-depressed older adults. Richard-Devantay (2012), investigated both phonemic and semantic fluencies and found that depressed participants performed worse than non-depressed participants on both tests (d = 0.49 and d = 1.12 respectively). Rainer et al (2006) also found that depressed older adults performed worse than their non-depressed control group on a test of verbal fluency (d = 0.61), although did not stipulate which type of fluency they tested for (phonemic, semantic or both). From this evidence it seems unlikely that depressed older adults exhibit executive functioning deficits as tested for by phonemic fluency tasks. There are some indications that depressed participants may struggle with semantic fluency tasks compared to their non-depressed counterparts, however further evidence would be needed to draw any firm conclusions.

5.4.2 Processing speed

Psychomotor slowing, and its cognitive counterpart, slowed cognitive processing speed are prominent symptoms of depressive disorders. It is therefore important to think about whether impairments on neuropsychological measures of EF might actually be due to defects in processing speed (Caligiura and Ellwange, 2000). Trail A of the Trail Making Test, is often used as a measure of processing speed. Five studies in this review reported data on Trial A, with three (Liu et al, 2012; Schoepflin-Sanders et al, 2006; Reppermund et al, 2011) finding that there was no difference between the performance of depressed and non-depressed individuals. Two studies (Richard-Devantay et al, 2012; Ganguli et al, 2006) found that depressed participants did perform worse (i.e. took longer to complete the task) than those in non-depressed control groups. However, the effect sizes found for Trial A (Richard-Devantay et al, 2012 – d = 0.4; Ganguli et al, 2006 – d = 0.43) were smaller than those of all the neuropsychological measures assessing EF not only within these two studies (e.g. Richard-Devantay, 2012, ES for Trail B, d = 1.92), but also of all studies included in this review. Therefore it appears unlikely that processing speed accounts for the neuropsychological EF deficits found by these studies.

6. CONCLUSIONS

In conclusion, depressed older adults do seem to exhibit more executive functioning deficits than their non-depressed counterparts. Despite a general lack of evidence in this area and the methodological limitations of studies in this review (see section 4.1), there appears to be a tendency for depressed older adults to display poorer EF abilities than non-depressed individuals in shifting, inhibition and verbal fluency.

Depressed older adults were found to have difficulty in shifting back and forth between mental sets, as measured by the WCST, and to a lesser extent the TMT. This is significant as it may help us better understand a common cognitive aspect of depression, rumination. Rumination is characterized by the continuous focus of attention on the symptoms of distress, past distressing events and perceived personal inadequacies (Beck, 1976). Finding it difficult to shift cognitive or mental sets could explain why these individuals therefore find it challenging to prevent the cycle of negative cognitions that is rumination. This in turn makes it difficult to focus on positive aspects that could alleviate distress, such as engaging in problem solving, or cognitive restructuring (all aspects of a commonly used psychological therapy for depression, Cognitive Behavioural Therapy). A better understanding of how shifting deficits may interfere with therapy could allow clinicians to tailor interventions to work around these deficits, to improve the effectiveness of interventions. This is also of importance as there is evidence that neuropsychological deficits that are present in depression (e.g. EF deficits), persist in remission of late life depression (Bhalla et al., 2006).

Few studies in this review investigated 'inhibition', although indications from those that did, suggest there may be an association between deficits in ability to inhibit and depression in older adults. This is in line with what Snyder (2013) found in his review and meta-analysis across the age ranges. Snyder (2013) found that whilst there was significantly impaired performance by depressed participants in comparison to controls on all neuropsychological measures of EF, evidence suggested that inhibition tasks demonstrated larger impairments in depressed participants than tasks that tapped

into the other EF domains. Peckham, Mc Hugh and Otto (2010) found that depressed individuals struggled to inhibit negative emotional stimuli, which consequently makes up the content of their working memory which would have an impact on rumination.

Unfortunately, none of the studies investigated the third subcategory of EF as characterised by Miyake's Model of EF (2000), 'updating'. The dearth of research on 'updating' cognitive abilities in depressed older adults points to an avenue for future EF research within this population, given the conclusions of other reviews in literature on adults (Snyder, 2013).

Verbal fluency was another commonly tested ability by the studies in this review. The evidence points to a tentative link (due to the limited number of studies testing for this) between depression and semantic fluency in older adults. This is in keeping with meta-analysis evidence from the literature adults (Zakzanis, Leach and Kaplan, 1998; Henry and Crawford, 2005; Snyder 2013).

These findings should be understood in the context of possible causal relationships between EF deficits and depression. Although this review has highlighted a number of EF deficits that are present in a depressed OA population, questions still remain regarding the causal nature of this relationship. For example, do people currently suffering from depression subsequently develop deficits in EF due to neurobiological changes that occur during depressive states, or is it the case that individuals with EF deficits are predisposed to develop depression, and as such the depression develops partly as a result of their underlying EF deficits? Recent studies have been able to shed some light on these questions. For example, Haddad, Harmer and Williams' (2014) recent study investigating EF abilities of those in remission from depression found that the EF deficits found during depressive states often remain upon remission from depression. Whilst Richard-Devantay et al. (2012) investigated the differences between individuals with first episode and recurrent depression finding that individuals suffering from recurrent depressive episodes display more marked EF deficits than those experiencing depression for the first time. However without good quality longitudinal studies it remains unclear about the direction of the causal link between EF and depression – understanding this

better would not only inform interventions (both pharmacological and psychological) for depression but could also perhaps guide preventative measures that promote mental wellbeing.

The quality of the studies in this review (as determined by a specially designed Quality Rating Scale, Appendix 2.2) were largely comparable, with the majority of studies deemed to be of 'acceptable' or 'good' quality. However, certain methodological limitations of some of the studies are noted including: small sample sizes; use of single neuropsychological measures to test per EF subset; and not controlling well for cofounding variables such as anxiety and processing speed.

7. LIMITATIONS

The restrictions imposed on the search terms used during the literature search in this review could have led to relevant literature being overlooked. Wider depression related search terms excluding the term 'Major' could be utilised in future reviews that can dedicated the necessary time and resources to completing this larger literature search. Also, the quality rating scale developed for this review whilst useful in providing a general measure of quality for comparison between studies within this review, is not a standardised quality measure, such as the CTAM. The use of a standardised quality measure if it were available would have added to the rigor of the conclusions, and allowed for comparison with other reviews utalising the same measure.

Lastly, this review included studies that investigated EF and depression in older adults, without discriminating for depression severity. For example, although this review excluded those studies that included older adults in remission from depression, it included studies whose depressed population were mildly, moderately and severely depressed. There is evidence that severity of depression impacts on EF (e.g. Snyder – for meta-analysis across age ranges; Boone et al., 1995; Palmer et al., 1996) and results from this review have highlighted the possible impact of severity on review findings.

8. FUTURE DIRECTIONS

Future reviews could aim to address the severity limitation of this review as outlined above by limiting inclusion to studies that have investigated either Major Depressive Disorder or Minor Depressive Disorder alone, or inpatient verses community based participant samples. Future directions for studies investigating depression and EF in older adults should also attempt to address the methodological limitations of studies included in this review and gaps in the literature. This would include studies that are based on power calculations and have sample sizes to detect small to medium effect sizes, studies using multiple neuropsychological tasks to test for the same EF ability and studies that investigate the 'updating' facet of EF as outline by Miyake (2000).

9. REFERENCES

- Alderman, N., Burgess, P., Emslie, H., Evans, J., & Wilson, B. (2003). "Behavioural assessment of the dysexecutive syndrome (BADS)." *Journal of Occupational Psychology, Employment and Disability, 5,* 33-37.
- Alexopoulos, G.S., Meyers, B.S., Young, R.C., Campbell, S., Sibersweig, D., and Charlson, M. (1997) The 'Vascular Depression' Hypothesis. *Archive of General Psychiatry*, 54, 915-922.
- American Psychiatric Association (1994). Diagnostic and statistical manual of mental health disorders (4th ed). Washington DC.

- Baldwin, R., Jeffries, S., Jackson, A., Sutcliffe, C., Thacker, N., Scott, M. and Burns, A. (2005). Neurological findings in late-onset depressive disorder: comparison of individuals with and without depression. *British Journal of Psychiatry*, 186, 308-313.
- Baudic, S., Tzortzis, C., Barba, G.D., and Traykov, L. (2004) Executive deficits in elderly patients with major unipolar depression. *Journal of Geriatric Psychiatry Neurology*, 17, 195-201.
- Beck, A.T. (1976). Cognitive therapy and the emotional disorders. New York: International Universities Press.
- Benton, A.L., Hasher, K., and Sivan, A.B. (1983). *Multilingual Aphasia Examination*. Iowa City, AJA Associates.
- Bhalla, R.K, Butters, M.A, Mulsant, B.H., Begley, A.E., Zmuda, M.D., and Schoderbek, B. (2006). Persistence of neuropsychological deficits in the remitted state of late-life depression. *American Journal of Geriatric Psychiatry,* 14, 419-427.
- Boone, K.B., Lesser, I.M., and Miller, B.L. (1995). Cognitive functioning in a geriatric depressed population: relationship of presence and severity of depression to neuropsychological scores. *Neuropsychology,* 9, 390-398.
- Burgess, P. and Shallice, T. (1997) *The Hayling and Brixton Tests. Test manual.* Bury St Edmunds, UK: Thames Valley Test Company.
- Butters, M.A., Whyte, E.M., Nebes, R.D., Begley, A.E., Dew, M.A., Musant, B.H., Zmuda, M.D., Bhalla, R., Meltzer, C.C., Pollock, B.G., Reynolds, C.F and Becker, J.T. (2004). The Nature and Determinants of Neuropsycholgoical Functioning in Late-Life Depression. *Archive of General Psychiatry*, 61, 587-595.
- Caligiuri, M., & Ellwanger, J. (2000). Motor and cognitive aspects of motor retardation in depression. *Journal of Affective Disorders, 57*, 83-93.
- Centre for Reviews and Dissemination (2009). *Systematic Reviews: CRD's guidance for undertaking reviews in health care.* York: CRD, University of York.

- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112, 155-159.
- Connelly, S.L., Hasher, L. and Zacks, R.T. (1991). Age and reading: the impact of distraction. Psychology and Aging 6, 533–541.
- Dunkin, J.J., Leuchter, A.F., Cook, I.A., Kasl-Godley, J.E., Abrams, M., and Rosenberg-Thompson, S. (2000) Executive dysfunction predicts non-response to fluoxetine in major depression. *Journal of Affective Disorders*, 60, 13-23.
- Eggermont, L.H.P., Milberg, W.P., Lipsitz, L.A., Scherder, E.J.A., and Leveille, S.G. (2009) Physical Activity and Executive Function in Aging: The MOBILIZE Boston Study. *The American Geriatrics*, 57, 1750 -1756.
- Elderkin-Thompson, V., Mintz, J., Haroon, E., Lavretsky, H., and Kumar, A. (2007). Execuitve dysfunction and memory in older patients with major and minor depression. *Archives of Clinical Neuropsychology*, 22, 261-270.
- Folstein, M.F., Folstein, S.E, and McHugh, P.R (1975). "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician". *Journal of Psychiatric Research* 12, 189–98.
- Fossati, P., Coyette, F., Ergis, A.M., and Allilaire, J.F. (2002). Influence of age and executive functioning on verbal memory of inpatients with depression. *Journal of Affective Disorders*, 68, 264-271.
- Ganguli, M., Du, Y., Dodge. H.H., Ratcliff, G.G., and Chang, C.H. (2006) Depressive Symptoms and Cognitive Decline in Late Life A Prospective Epidemiological Study. *Archive of General Psychiatry*, 63, 153-160.
- Hammar, A., and Ardal, G. (2009). Cognitive functioning in major depression - a summary. *Frontiers in Human Neuroscience*, 3, 1-7
- Henry, J.D., and Crawford, J.R. (2005). A meta-analytic review of verbal fluency deficits in depression. *Journal of Clinical and Experimental Neuropsychology*, 27, 78-101.

- Kramer, A.F., Humphrey, D.G., Larish, J.F., Logan, G.D., and Strayer, D.L. (1994). Aging and inhibition: beyond a unitary view of inhibitory processing in attention. *Psychology and Aging*, 9, 491-512.
- Kramer-Ginsberg, E., Greenwald, B.S., Krishnan, K.R.R., Christiansen, B., Hu, J., Ashtari, M., Patel, M., and Pollack, S. (1999) Neuropsychological Functioning and MRI signal Hypertensities in Geriatric Depression. *American Journal of Psychiatry*, 156, 438-444.
- Landro, N.I., Satiles, T.C., Sletvold, H. (2001). Neuropsychological function in nonpsychotic unipolar major depression. *Neuropsychiatry, Neuropsychology, and Behavioral Neurology*, 14, 233-240.
- Lee, R.S.C., Hermens, D.F., Porter, M.A., and Redoblado-Hodge, M.A. (2012). A meta-analysis of cognitive deficits in first-episode Major Depressive Disorder. *Journal of Affective Disorders*, 140, 113-124.
- Liberati, A., Altman, D.G., Tetzlaff, J., Mulrow, C., Gotzsche, P.C., Ionnidis, J.P.A., Moher, D. (2009). The PRISMA statement for reporting systematic reviews and metaanalyses of studies that evaluate health care interventions: Explanation and elaboration. *British Medical Journal*, *6*, 1-28.
- Liu, M., Change, Y., Ku, Y., Lee, S., Huang, C., Chen, S. Chen, S., Chu, C., Lui, W. and Lu, R. (2012). Executive functions in elderly men. *Age*, 34, 59-66.
- Mackin, R.S., and Arean, P.A. (2009) Impaired financial capacity in late life depression is associated with cognitive performance on measures of executive functioning and attention. *Journal of the International Neuropsychological Society*, 15 , 793 – 798 .
- Mioshi, E., Dawson, K., Mitchell, J., Arnold, R. and Hodges, J. (2006). The Addenbrooke's Cognitive Examination Revised (ACE-R): a brief cognitive test battery for dementia screening. *International Journal of Geriatric Psychiatry,* 21, 1078-1085.

- Miyake, A., Friedman, N.P., Emerson, M.J., Witzki, A.H., and Howerter. A. (2000) The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. *Cognitive Psychology*, 41, 49-100.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G. and The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annuals of Internal Medicine*, *6*, 1-6.
- Nebes, R.D., Butters, M.A., Mulsant, B.H., Pollock, B.G., Zmuda, M.D., Houck, P.R., and Reynolds, C.F. (2000). Decreased working memory and processing speed mediate cognitive impairment in geriatric depression. *Psychological Medicine*, 30, 679–691.
- Nosek, B. A., and Banaji, M. R. (2001). The go/no-go association task. *Social Cognition,* 19, 161-176.
- Ottowitz, W.E., Dougherty, D.D., and Savage, C.R. (2002). The Neural Network Basis for Abnormalities of Attention and Executive Function in Major Depressive Disorder: Implications for Application of the Medical Disease Model to Psychiatric Disorders. *Harvard Review of Psychiatry*, 10, 86-99.
- Palmer B.W., Boone, K.B., Lesser, I.M., Wohl, M.A., Berman, N., and Miller, B.L. (1996). Neuropsychological deficits among older depressed patients with predominantly psychological or vegetative symptoms. *Journal of Affective Disorders,* 1, 17-24.
- Peckham, A.D., McHugh, R.K., and Otto, M.W. (2010). A meta-analysis of the magnitude of biased attention in depression. *Depression and Anxiety*, 27, 1135-1142.
- Porter, R.J., Gallagher, P., Thompson, J.M. and Young, A.H. (2003) Neurocognitive impairment in drug-free patients with major depressive disorder. *British Journal of Psychiatry*, 182, 214-220.
- Rainer, M.K., Mucke, H.A.M, Zehetmayer, S., Krampla, W., Kuselbauer, T., Weissgram, S., Jungwirth, S., Tragl, K.H., and Fischer, P. (2006). Data From the VITA Study Do Not

Support the Concept of Vascular Depression. *American Journal of Geriatric Psychiatry*, 14:6, 531–537

- Rapp, M.A., Dahlman, K., Sano, M., Grossman, H.T., Haroutunian, V., and Gorman, J.M. (2005) Neuropsychological Differences Between Late-Onset and Recurrent Geriatric Major Depression. *The American Journal of Psychiatry*, 162, 691-698.
- Reitan, R.M., and Davison, L.A. (1974) *Clinical Neuropsychology: Current Status and Applications.* New York, John Wiley and Sons.
- Reppermund, S., Brodaty, H., Crawford, J.D., Kochan, N.A., Slavin, M.J., Trollor, J.N., Draper, B., and Sachdev, P.S. (2011) The relationship of current depressive symptoms and past depression with cognitive impairment and instrumental activities of daily living in an elderly population: The Sydney Memory and Ageing Study. *Journal of Psychiatric Research,* 45, 1600-1607.
- Richard-Devantoy, S., Jollant, F., Kefi, Z., Turecki, G., Olié, J.P., Annweiler, C., Beauchet, O., and Le Gall, D. (2012) Deficit of cognitive inhibition in depressed elderly: A neurocognitive marker of suicidal risk. *Journal of Affective Disorders*, 140, 193–199.
- Sair, H.I., Welsh-Bohmer, K.A., Wagner, H.R., and Steffens, D.C. (2006). Ascending digits task as a measure **of** executive function in geriatric depression. *The Journal of Neuropsychiatry and Clinical Neurosciences*, 18, 117-120.
- Schoepflin-Sander, M.L., Lyness, J.M., Eberly, S., King, D.A., and Caine, E.D. (2006). Cerebrovascular Risk Factors, Executive Dysfunction, and Depression in Older Primary Care Patients. *American Journal of Geriatric Psychiatry*, 14, 415-512.
- Sheikh J.I., and Yesavage J.A. (1986). Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontology : A Guide to Assessment and Intervention*, 165-173, NY: The Haworth Press.

- Spitzer, R.L., Williams, J.B.W., Gibbon, M. and First, M.B. (1992). The Structured Clinical Interview for DSM-III-R (SCID) I: History, Rationale, and Description *Arch Gen Psychiatry.* 49, 624-629.
- Steffens, D.C., and Potter, G.G. (2008). Geriatric depression and cognitive impairment. *Psychological Medicine*, 38, 163-175.
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643–662.
- Synder, H.R. (2013). Major Depressive Disorder Is Associated With Broad Impairments on Neuropsychological Measures of Executive Function: A Meta-Analysis and Review. *Psychological Bulletin*, 139, 81-132.
- Tarrier, N.,&Wykes, T. (2004). Is there evidence that cognitive behaviour therapy in an effective treatment for schizophrenia: A cautious or cautionary tale? *Behaviour Research and Therapy, 42*, 1377-1401.
- Thomas, A.J., and O'Brien, J.T. (2008). Depression and cognition in older adults. *Current Opinion in Psychiatry*, 21, 8-13.
- Turner, G.R., and Spreng, R.N. (2012). Executive functions and neurocognitive againg: dissociable patterns of brain activity. *Neurobiology of Aging*, 33, 1-13.
- Williams, J.B.W. (1988). A structured interview guide for the Hamilton depression rating scale. *Archive of General Psychiatry*, 45, 742-747.
- Zakzanis, K.K., Leach, L., and Kaplan, E. (1998). On the nature and pattern of neurocognitive function in major depressive disorder. *Neuropsychiatry, Neuropsychology and Behavioural Neurology*, 11, 111-119.

Chapter 2: Major Research Project

Depression and Overgeneral Memory in Older Adults: The role of Executive Functioning

Deirdre Burns*

Written according to guidelines for submission to the Journal of Clinical and Experimental Neuropsychology. (see Appendix 1)

*Address for correspondence:
Mental Health and Wellbeing
Administration Building
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow, G12 0XH
Tel: 0141 211 3927

Submitted in partial fulfillment of the requirement for the degree of Doctorate in Clinical Psychology (DClinPsy)

LAY SUMMARY

People's ability to recall memories of their own specific life events can be impaired when they are suffering from depression. This study looked at whether people's brain abilities could account for this relationship, specifically a set of brain functions that are concerned with planning and goal oriented behaviour. The findings of this study replicated the findings of previous studies, that depressed individuals find it harder to recall their own specific life events than do non depressed individuals. Secondly, it was found that whether or not people found it difficult to switch quickly between tasks accounted for this relationship between their memory recall and if they were depressed or not. The study also indicated that another aspect of brain functioning, ability to inhibit information, might also account for this relationship. However, most likely due to the small numbers of people who took part in this study, this was not proven. It is recommended that further research replicates this study with larger numbers of people to allow for further clarification.

ABSTRACT

Background: Depression is a common presenting problem for older adults and Over General Memory (OGM) has also been found to be linked to depression. Recently it has been proposed that deficits in Executive Functioning (EF) could explain OGM (Williams et al., 2007). Despite studies in both child and adult populations, this hypothesis has yet to be tested in a depressed older adult sample.

Aims: The main aim was to test the EF hypothesis for OGM in a depressed sample of adults aged 65 years and older. Additional aims were to add to the growing literature base investigating the relationship between the three variables (depression, OGM and EF) within an older adult population.

Methods: 14 depressed older adults and 15 non-depressed older adults completed a series of EF neuropsychological tests and the Autobiographical Memory Test (AMT). Miyake et al.'s (2000) 3 facets model of EF was used to define EF. The Trail Making Test was used to test for 'shifting' ability, The Color-Word Inference Test was used to test for 'inhibition' and the Random Number Generation Test was used to test for 'updating'.

Results: Shifting ability was found to account for the relationship between depression and OGM within a sample of older adults. Although indications are that inhibition may also account for OGM the finding was narrowly non-significant. Updating was not found to account for the relationship between depression and OGM. Additionally, depressed individuals were found to have more OGM and EF deficits (shifting and inhibition only) than their non-depressed counterparts. OGM and deficits in EF (shifting and inhibition only) were found to be significantly positively correlated.

Conclusions: Relationships between depression, OGM and EF in an older adult population were found. There is partial support for the EF hypothesis of OGM in older adults, as shifting ability was found to account for the relationship between depression and OGM. Findings indicate that inhibition may be a key element in explaining this relationship, although further research is needed to clarify this using larger sample sizes. Further research should aim to address certain methodological limitations of this study, such as larger sample sizes and using multiple neuropsychological tests per executive functioning ability.

CONTENTS PAGE

Tables

1. INTRODUCTION

Depression is a common presenting problem for Older Adults (OA) (Kvaal, McDougall, Brayne, Matthews, and Dewey, 2008) with approximately 10–13% of this population having major depression (Bruce et al., 2002). There is also evidence that relapse rates in depression are higher in the older adult population than other population groups (Mitchell and Subramaniam, 2005). The United Kindom's population is aging, and with an increasing number of people living into old age (Lutz, Sanderson and Scherbov, 2008) it is likely that the number of older adults developing depression is set to increase. This will put pressure on already stretched mental health services in the near future. Better understanding of late life depression and what influences vulnerability to depression in this age group could inform interventions for the increasing number of individuals presenting for help. Previous research has identified certain social (for example, social isolation – Hawton et al., 2011), physical (for example, illness burden - Hatfield, Hirsch and Lyness, 2013) and psychological variables (for example, self esteem – Schroevers, Ranchor and Sanderman, 2003; hopelessness - Conaghan and Davidson, 2002; poor interpersonal problem solving - Gibbs, Dombrovski, Morse, Siegle, Houck and Szanto, 2009) are associated with vulnerability to depression. Over General Memory (OGM) has also been found to be linked to depression (Puffet, Jenin-Marchot, Timsit-Berthier and Timsit, 1991; Kuyken and Dalgleish, 1995; van Vreewijk and de Wilde, 2004; Raes et al., 2006; Williams & Scott, 1988).

OGM is understood as the phenomenon of producing less specific/more generalised responses when asked to give a specific autobiographical memory (AM) (Williams et al., 2007). For example, on the Autobiographical Memory Test (AMT – Williams and Broadbent, 1986) where one is required to retrieve a specific, discrete personal memory in response to a cue word (e.g. summer), an individual with OGM would respond more frequently with categorical memories (e.g. "I enjoyed all my

childhood summer holidays") than the required specific episodic memories (e.g. "When I had an ice-cream as I was walking along Brighton pier last summer"). One of the most prominent models of AM is Conway and Pleydell-Pearce's (2000) 'Self Memory System'. This model proposes that there is a continuous hierarchy of AM with representations ranging from broad themes in the life story, through to life time periods, general events and lastly event specific memories. To generate these event specific memories (ESMs) it is postulated that individuals either engage in a top-down strategic search process of moving downwards through the hierarchy of AM (from broader to more specific memories) generating AM's at each of the stages, each in turn cueing further memory retrieval (generative retrieval), or when ESMs are retrieved directly, and unintentionally, as the memory is activated by cues in the environment.

1.1 Over General Memory (OGM) and Depression

AM is thought to contribute to an individual's sense of self-identity across time (Conway, 2003) and OGM is relevant to psychiatric illnesses that are thought to involve core alterations in one's sense of self, such as depression (Tulving, 2001). OGM has also been linked with failure to recover from depression (Brittlebank, Scott, Williams and Ferrier, 1993) and with longer periods of time to recover from depression (Raes et al., 2006), suggesting that overgenerality of memory retrieval may be a trait marker which can predict recovery from depression.

1.2 OGM and Older Adults

OGM has been linked with depression in the older adult population. Older adults with depression have been found to be less specific in their memory retrieval than age-matched controls (Ricarte et al., 2011; Birch and Davidson, 2007). Also, studies have shown that OGM increases with age (e.g. Ros, Latorre and Serrano, 2010) in normal healthy populations, indicating that older adults could be predisposed to OGM simply due to the normal aging process.

1.3 Theories of OGM

Work has been conducted that attempts to understand the factors that contribute to OGM. Currently, three theories have been investigated (see below). More recently, Williams et al (2006) have put forward a model that incorporates all three theories, the CaR-FA-X model. The CaR-FA-X model posits that OGM occurs when the generative search process is aborted prematurely as a result of one or more of the proposed mechanisms as outlined below.

The *'Affect Regulation' of 'Functional Avoidance'* (Williams, 1996)

Williams (1996) stated that OGM may occur as a consequence of cognitive avoidance. In essence, those with depression engage in cognitive avoidance as a coping mechanism, allowing them to avoid painful specific personal memories from the past. This cognitive avoidance gives rise to a non-specific retrieval style which does not allow for recall of specific personal events and generates more over-general memories.

The *'Rumination' Hypothesis* (Williams et al., 2007)

Williams et al (2007) later proposed that whilst experiencing depression it is rumination that interferes with memory searches. Individuals with depression have highly activated negative self-representations that during memory searches cause the individual to become 'captured' at the general stage of self-representation where they negatively ruminate about the self, rather than progressing to a specific memory, thus producing over general memories.

The *'Executive Control'* hypothesis (Dalgleish et al, 2007)

Whilst the above two theories have been supported in literature, this third theory of OGM states that the aspects of these theories that have been supported can be understood by executive functioning deficits. The *'Executive Control'* hypothesis states that Executive Functioning (EF) deficits could be impairing the ability of an individual to remember specific episodic memories (Dalgleish et al., 2007;

Holland, Ridout, Walford and Geraghty, 2012; Piolino et al., 2010). The concept of EF encompasses a wide range of cognitive abilities but can be generally thought of as a set of abilities required to guide goal oriented behaviour, especially in novel situations. Miyake, Friedman, Emerson, Witzki and Howerter (2000) classified executive functioning into three subcomponents: inhibition, shifting and updating/monitoring. Little is known about which Executive Functioning processes or subcomponents might influence OGM, although recent research has suggested that there may be some relationships.

1.4 'Executive Control' Hypothesis of OGM

1.4.1 Shifting

Shifting is the ability to shift back and forth between multiple tasks, operations or mental sets (Monsell, 1996). Cognitive 'shifting' is important to consider with respect to OGM due to the conceptual relation between the inability to shift mental set (i.e. Rumination) and over-generality (Williams et al, 2007). This is especially important to consider within a depressed population as rumination has been shown to be related to depressive symptoms (for a recent review, see Nolen-Hoeksema, 2004). However despite this, Valentino, Bridgett, Hayden and Nuttall (2012) recent study is the only study to date to consider 'shifting' in relation to OGM. They did not find a relationship between 'shifting' ability and OGM in a population of child and adolescent inpatients.

1.4.2 Inhibition

Inhibition is the ability to deliberately inhibit dominant or automatic responses when necessary (Miyake et al 2000). In his series of studies published in 2007, Dalgleish et al. (2007) postulated that OGM may arise from the inability to inhibit interference from irrelevant information activated during the search for a specific memory. He found that individuals who displayed more 'task errors' on a wide range of EF tests were also found to have had more OGMs on the AMT. It was suggested that this could indicate poorer inhibition as individuals were unable to inhibit irrelevant information

generated early during memory retrieval. For example, an impaired ability to inhibit the memories that are generated at the start of a memory search may result in the search ceasing at this more general level without the person ever 'getting to' the more discrete personal memories, thus producing more OGMs. Indeed, Raes, Vertraeten and Bijttebier (2010) found that lower inhibition in a community group of children mediated the association between depressive symptoms and OGM, however of note, this study used a self-report measure of inhibition. Piolino et al. (2010) found that age related decreases in level of specificity of autobiographical memories were mediated by participants' performance on executive function tests that measure inhibition. However, in contrast, Valentino et al. (2012) did not find inhibition to be associated with OGM in a psychiatric sample of children and adolescents nor did Holland et al (2012) in a non-clinical sample of older adults.

1.4.3 Updating

Updating represents the ability to update and monitor working memory representations (Miyake et al, 2000). Working memory is the system that actively holds multiple pieces of transitory information in the mind, where they can be manipulated (Baddely and Hitch, 1974). Working memory tasks require monitoring to allow for the manipulation of information as part of goal-directed action and therefore update information in the system according to its relevance to the task in hand. All these cognitive demands are key elements of navigating generative searches through the hierarchical AM system as proposed by Conway and Pleydell-Pearce (2000). Updating working memory with newly generated memories during the top-down retrieval process, monitoring progress through the memory search and verifying new memories to see if they meet eligibility are all crucial aspects in order to progress from general to specific memories. Deficits in cognitive 'updating' abilities could lead to the termination of the search at the more general level. Indeed, Holland et al (2012) found that updating rather than inhibition was the source of age related reduction in AM specificity in a non-clinical sample of older adults. In addition, Piolino et al (2010) also found updating abilities mediated the age-related decrease in level of specificity of autobiographical memory.

As is evident however, there has been limited research conducted to date with respect to the EF hypothesis of OGM, with some studies having methodological limitations (e.g. using self report measures rather than neuropsychological tests, Raes et al 2010). The recent study by Valentino et al (2012) was the first to investigate all three subcomponents of Executive Functioning with respect to OGM, and this was within a psychiatric population of children and adolescents. Valentino et al (2012) found that whilst updating (as measured for by category verbal fluency) was associated with OGM, both inhibition and shifting were not.

1.5 'Executive Control' hypothesis and Older Adults

The EF hypothesis could be particularly important to consider within the older adult population as it has been widely accepted that deficits in executive function increase with age (MacPherson, Phillips, & Della Sala, 2002; Wecker, Kramer, Wisniewski, Delis, & Kaplan, 2000). This executive functioning deterioration is also characteristic of depressed elderly populations (Lockwood, Alexopoulos, and van Gorp, 2002; Nebes et al., 2000). As mentioned above, the relatively new area of the EF hypothesis for OGM has not yet been widely researched. There have been some studies in depressed populations, adult (Dalgleish, 2007) and child (Raes et al, 2010; Valentino et al 2012); and in non clinical adult populations (Sumner, 2012; Holland et al, 2012; Piolino et al, 2010). The EF hypothesis has yet to be studied in an OA clinical population. It is therefore proposed to investigate the executive control hypothesis of OGM (all three subcategories, shifting, updating/monitoring and inhibition) within a depressed older adult population.

2. AIMS AND HYPOTHESIS

The main aim of this study is to investigate the evidence for the executive functioning hypothesis of OGM (including all subcategories of executive functioning – shifting, inhibition and updating) within

a depressed older adult population. Secondary aims are to investigate the relationships between depression, OGM and EF in a depressed older adult population.

It is hypothesised that within an older adult sample:

1. Those with depression will produce more over general memories (therefore demonstrating low AM memory specificity) than those without depression.
2. Depressed individuals will have greater impairment in all aspects of executive functioning abilities that those without depression.
3. Individuals who produce more overgeneral memories (therefore demonstrating low AM memory specificity) will exhibit more deficits in all aspects of EF than those who produce more specific memories (high AM memory specificity).
4. The relationship between depression and over general memory will be accounted for by executive functioning abilities.

3. METHODOLOGY

3.1 Participants and procedures

Participants were recruited from community mental health teams (CMHTs) for older people in Lanarkshire, Scotland. Eligible candidates were approached by their named mental health clinician and asked if they would like to participate. After having some time to consider their participation in the study, potential participants passed their contact details to the researcher. Of the 16 that were approached, 2 declined to participate leaving a sample of 14 participants with depression. The control group (N = 15) was recruited from two local community groups for older people in Lanarkshire. Willing participants attended a local NHS building to meet with the researcher on one occasion to formally consent to the study and complete the testing procedures. The testing procedure took approximately one hour. This consisted of a short questionnaire (including brief medical history, age,

and educational attainment); a short cognitive screen to assess for cognitive impairment (MOCA); a test of intellectual functioning (Test Of Premorbid Functioning - TOPF); HADS; AMT and three neuropsychological tests (as outlined below).

3.2 Inclusion/Exclusion Criteria

All participants were required to be at least 65 years of age, with no history of serious head injury, stroke, Parkinson's Disease (or other neurodegenerative disease), dementia or currently taking cognitive enhancer medication. Those with mild cognitive impairment, as shown on the Montreal Cognitive Assessment (MOCA, Nasreddine et al., 2005), were also excluded. In addition, those in the depressed group were required to score eight or above on the depression subscale of the Hospital Anxiety and Depression Scale (HADS, Zigmond and Snaith, 1983), whilst those in the control group were required to score seven or below. One participant, referred by the CMHT for inclusion in the depressed group, failed to meet the cut-off score for depression on the HADS (score of seven). This participant's data was subsequently transferred to the control group.

3.3 Measures

3.3.1 Depression

The HADS (Zigmond and Snaith, 1983) is a standardised self-rating scale that measures for both anxiety and depression. It consists of 14 questions (seven relating to anxiety and seven relating to depression) and a maximum of 21 can be scored for both anxiety and depression (higher scores indicating more symptoms). Bjelland, Dahl, Haug and Neckelmann (2002) established (through a systematic review) the cut-off point for clinical cases using the HADS as 8/21 for anxiety or depression.

3.3.2 Intellectual Functioning

The Test of Premorbid Functioning - UK Version (TOPF UK) is a revised version of the Wechsler Test of Adult Reading (WTAR UK). Administering the TOPF enables clinicians to estimate an individual's level of intellectual functioning for adults ranging from 16-89 years of age. Individuals are required to read out loud a list of 70 words that increase in difficulty. A point is scored for each correctly pronounced word, and a score out of 70 is given.

3.3.3 Over General Memory (OGM)

The AMT (Williams and Broadbent, 1986) as described by Kuyken and Dalgleish (1995), involves 10 emotional words (five pleasant – happy, surprised, successful, safe and interested and five unpleasant – sad, angry, lonely, hurt and clumsy) that are used to cue memories and are presented in a random order. After presentation of each cue card participants were given 1 minute to come up with an autobiographical memory (specific time and place when something happened to them) that should be something that happened at a particular time on a particular day (i.e. lasting less than a day). Participants were given 60 seconds rather than the standard 30 seconds to answer after the presentation of each cue word on the AMT. This was to reduce effort burden during the AMT and is similar to other studies that used 60 seconds response limits with this client group – Holland et al, 2012; Ricarte et al, 2011). Their responses were recorded on a digital voice recorder for later categorising and scoring purposes. Responses that were localized in time and space and reflected a unique personal experience lasting less than 24 hours were recorded as 'Specific' memories. Those responses that reflected repeated or extended memories that lasted longer than 24 hours were recorded as non-specific (i.e. over general) memories. An independent rater rated 50% of AMT recordings and inter-rater reliability was excellent at 96%.

3.3.4 Neuropsychological measures

The Montreal Cognitive Assessment (MOCA)

To rule out potential participants having mild cognitive impairment (MCI), The Montreal Cognitive Assessment (MOCA) - a brief cognitive screening test designed to help detect mild cognitive impairment - was utilised. The test is scored out of 30 and scores of 25 or less indicate possible MCI. Participants in both depressed and control groups were required to score 26 or above to participate in the study. The MoCA has been validated for use with 55-85 year olds (Nasreddine et al, 2005).

Trail B – Delis-Kaplan Executive Function System (D-KEFS)

The cognitive ability 'Shifting,' as outlined by Miyake et al (2000) was tested for with the Trails subset of the Delis-Kaplan Executive Function System (D-KEFS, Delis, Kaplan and Kramer, 2001). The Trial Making Task (TMT), of which there are two main parts (parts A and B), has widely been used a measure of executive functioning (e.g Rapp, Dahlman, Sano, Grossmand, Haroutunian and Gorman, 2005; Butters et al., 2004). It is a visuomotor task that requires the participant to firstly connect numbered circles in sequential order with a drawn line (Trail A), and in part B, to alternate between connecting numbers and letters sequentially with a drawn line (Trail B). Trail B thus requires the participant to shift or switch between mental sets (in this case between letter and number sequences). As the TMT also loads on visual search and motor speed, it has been suggested (Schoepflin-Sanders, Lyness, Eberly, King and Caine, 2006) that Trail A scores should be used in conjunction with Trail B performance to minimize these confounding effects, giving a 'purer' EF (e.g. shifting) score. Therefore, in this study the outcome measure for Trail B was calculated by taking a participants Trail A completion time away from their Trail B completion time. This was done to give a clearer indication of 'shifting' cognitive abilities, as only Trail B utilizes this ability. Errors on both parts of the Trails test were pointed out by the administrator as soon as they were

made so the participant could rectify them. In this way 'error score' was incorporated into the outcome measure along with 'time to complete'.

Stroop Colour-Word Test (DKEFS)

Inhibition was tested for by the Stroop Colour-Word test (Stroop, 1935). The Stroop test, is a cognitive interference task that evaluates the ability to inhibit over-learned responses. The DKEFS (2001) version of the Stroop test, the Color-Word Inference Test, was used. The participant is first required to read out loud names of colours written on a page (part 1). This is followed by presenting the participant with a second piece of card with a series of coloured squares printed on it and asking them to call out the colours of the squares they can see (part 2). The final part of the test involves the participant being presented with a further piece of paper on which a series of names of colours are printed in incongruent colours (part 3). The subject is required to name the colour of the ink. For example, if the word "red" was presented in blue ink, the correct answer would be "blue" and not "red" ("red" being the over learned response). The time taken (in seconds) to complete this final part of the test (part 3) was used as the outcome measure (inference score).

The Random Number Generation Task (RNG)

The random number generation task (RNG, as used in Holland et al, 2012) was utilised to measure the *'Updating'* aspect of executive function. Participants were required to generate and vocalise a random series of numbers from the range of 1 - 9 for one minute. When producing the sequence, participants were asked not to say numbers in any well known sequence (e.g., 1, 2, 3 or 2, 4, 6), but to try to produce them randomly. The redundancy (R) score indexes how frequently each digit has occurred. High R scores indicate a certain number has occurred more, or less frequently than others, indicating poor randomness. To achieve a low (good) R score, one must remember which number has been said previously, monitor when it was said and suppress repeats or remember to produce new numbers. This measure loads on the updating factor in Miyake et al.'s (2000) analyses. Rgcalc

software (Towse & Neil, 1998) was used to assess randomness of the sequences produced by participants.

Trail A – Delis-Kaplan Executive Function System (D-KEFS)

Speed of Processing was tested for by D-KEFS Trails subset – Trail A. Psychomotor slowing, and its cognitive counterpart slowed cognitive processing speed, are prominent symptoms of depressive disorders (for example, in late life depression - Potter, Madden, Costello, and Steffens, 2013). It is therefore important to think about whether impairments on neuropsychological measures of EF might actually be due to deficits in processing speed (Caligiura and Ellwanger, 2000). Trail A of the TMT is often used as a measure of processing speed (for example, Liu et al., 2012; Schoepflin-Sanders et al, 2006).

The neuropsychological measures were administered in the following sequence for all participants: Test of Pre-morbid Functioning (TOPF), AMT; RNG; D-KEFS (trails) and the Stroop test.

3.4 Ethics approval

Ethical approval was provided by NHS West of Scotland Research Ethics Committee (see Appendicies 3.3. and 3.4). Approval was also gained from the NHS Lanarkshire Research and Development Department (see Appendix 3.5).

3.5 Study sample size

Estimation of sample size is based on the effect sizes (ES) of previous studies following two lines of research:

- Studies that have investigated OGM in Depressed versus Non Depressed populations.

Recent studies such as Birch and Davidson (2007) and Ricarte et al (2011) investigated OGM in depressed Older adult populations and found large effect sizes (d = 0.86 and d = 0.78 respectively),

and there have been similar studies in the adult population that have found very large effect sizes (Wessel, Merren, Peeters, Arntz and Merckelbach, 2001 – d = 1.2).

- Studies that have investigated Executive Functioning in Depressed versus Non Depressed populations

A recent study looking at executive functioning in a depressed older adult population found very large effect sizes (Lockwood et al, 2002), including using some of the tests that this study proposes to use (e.g. Stroop test – ES = 1.29 and D-KEFS Trails test – ES = 1.54). A recently published review and meta-analysis of executive functioning and major depressive disorder by Synder (2013) found medium to large effect sizes (e.g. Stroop test – d = 0.73 and D-KEFS Trails test – d = 0.59).

Based on these findings large effect sizes were expected in the current study, since it used similar methodology, participant groups and measures as the studies mentioned above.

Using the G* Power 3 tool (Faul, Erdfelder, Lang, and Buchner, 2007) it was estimated that this study would require 21 participants per group (N = 42) to allow for 0.8 power ($\alpha = 0.05$, Effect Size (d) = 0.8*)

*Effect Size based on estimates from Cohen (1988) where large effect sizes are estimated at d = 0.8

4. RESULTS

Firstly, the participant characteristics are described (see section 4.1 and Table1). This is followed by the comparisons of quantitative values between the two groups (depressed and control) using independent t-tests (which addresses Hypothesis 1 and 2 - see section 4.2, 4.3 and Table 2). Next, correlations using both pooled and grouped data were employed to investigate the relationship between overgeneral memory and the three EF's – shifting, updating and inhibition (which addresses

Hypothesis 3 - see section 4.4 and Table 3 and 4). Finally, two separate Logistic Regressions were carried out to analyse whether executive function could explain the relationship found between overgeneral memory and depression (which addresses Hypothesis 4 – see section 4.5 and Tables 5 and 6). Logistic regression was used to analyse the data due to the small study sample obtained (as used in Valentino et al, 2012; Holland et al, 2012). If larger participants numbers were obtained mediation analysis (as used by Dalgleish et al., 2007) would have been employed as the preferred statistical technique.

4.1 Participant characteristics

In total 29 participants were recruited to the study, 14 meet criteria for the depressed group and the remainder made up the control group. Age, education, intellectual functioning, cognitive ability, depression and anxiety are compared for depressed and control participants in Table 1. Control participants were slightly older (M = 75.69 years of age) than depressed participants (M = 74.29 years of age), although the effect is non-significant. There were no differences in years of education received, intellectual functioning (TOPF), or cognitive abilities (MOCA) between the two groups. Despite depressed participants (mean score of 8.08) scoring higher on the anxiety rating scale than control participants (M = 5.96), this was not a significant difference (p = 0.108). As expected, scores on the depression rating scale (HADS) were significantly higher for the depressed participants (M = 10.71) compared to the control (M = 2.73) participants (p = < 0.0001).

Table 1. Participant characteristics

	Depressed (n = 14) Mean (SD)	**Controls (n = 15)** Mean (SD)	p
Age (years)	74.29 (6.55)	75.69 (6.41)	.557
Education (years)	11.00 (1.47)	11.07 (1.49)	.904
TOPF	51.79 (8.53)	50.60 (11.00)	.750
MOCA	27.42 (1.02)	27.67 (0.82)	.491
HADS depression	10.71 (2.59)	2.73 (2.31)	<.0001*
HADS anxiety	8.08 (4.17)	5.69 (5.04)	.180

Comparisons of quantitative values between the two groups were performed using independent t-tests (see Table 2). One variable was found to violate assumptions of normality, RNG. Therefore this variable was transformed using Log10 prior to any analysis. After transformation RNG was subsequently found to meet assumptions of normal distributions and parametric tests were employed.

4.2 Depression and OGM

It was hypothesized (Hypothesis 1) that depressed individuals would produce more over general memories (therefore demonstrating low AM memory specificity) than those without depression. Depressed participants were indeed found to have less specific autobiographical memory, as measured for by the AMT (M = 2.36, SD = 2.06) than controls (M = 7.67, SD = 1.35). An independent t-test showed that this difference was significant, t (24) = 7.42 , p = < 0.0001, with a very large effect size (d = 2.97).

4.3 Depression and EF

It was hypothesized (Hypothesis 2) that depressed individuals would exhibit greater impairment in all aspects of executive functioning abilities that those without depression. Depressed participants were found to exhibit more EF deficits than their non-depressed counterparts (see Table 2.). Those with depression took significantly longer to complete the shifting Trails task (M = 105.71, SD = 27.73) than control participants (M = 41.07, SD = 20.00), t (24) = 6.60, p = < 0.0001, with a very large effect size (d = 2.60). Depressed participants were also found to take significantly longer to complete the Stroop test (M = 112.93, SD = 35.00) than those without depression (M = 71.67, SD = 21.04), t(24) = 3.52, p = < 0.05, again with a very large effect size (d = 1.42). Although depressed participants on average performed worse on the updating (RNG) task (M = 0.46, SD = 0.35) than control participants (M = 0.24, SD = 0.29), this difference was not found to be significant, t (24) = 1.709, p = 0.100. Similarly, on average, depressed participants demonstrated a slower speed of

processing as measured for by Trail A (M = 68.77, SD = 32.87) than the control group (M = 52.92, SD = 12.03), however this was not found to be significant, t (24) = 1.942, p = 0.071.

Table 2. AMT and EF for depressed and control groups.

		Depressed (n = 14) Mean (SD)	**Control (n = 15)** Mean (SD)	**P**
AMT	**Specificity** (number of specific answers)	2.36 (2.06)	7.67 (1.35)	<.0001*
RNG	**LogRNG**	0.46 (0.35)	0.24 (0.29)	.100
Trails	**Trail A** (time in seconds)	68.77 (32.87)	52.92 (12.03)	.071
	Trail B - Shifting (time in seconds)	105.71 (27.73)	41.07 (20.00)	<.0001*
Stroop	**Inference** (time in seconds)	112.93 (35.00)	71.67 (21.04)	.001*

4.4 OGM and EF

It was hypothesized (Hypothesis 3) that individuals who produced more overgeneral memories (therefore demonstrating low AM memory specificity) would also exhibit more deficits in all aspects of EF than those who produce more specific memories (high AM memory specificity). Data for the depressed and control group were combined and correlations used to investigate the relationship between overgeneral memory and the three EF's – shifting, updating and inhibition (see Table 3). Both shifting (Trail B, r = -0.749, p = <0.0001) and inhibition (Stroop, r = -0.608, p = <0.05) were found to negatively relate with memory specificity. As time to complete the Trail B test increases (indicating reduced shifting ability) memory specificity decreases (increased OGM). Shifting ability accounts for 56% of the variability in memory specificity ($R^2 = 0.561$). As time to complete the Stroop test increases (indicating reduced ability to inhibit) memory specificity decreases (increased OGM). Ability to inhibit accounts for 37% of the variability in memory specificity ($R^2 = 0.369$). 'Updating', as measured for by the RNG test, was not found to be significantly related to memory specificity.

Table 3. Correlations between AMT and EF for pooled participant data.

	AMT specificity		
	Correlation	R^2	Sig. (2-tailed)
'Updating' RNG	-.142	0.020	0.488
'Shifting' TrialsB (time to complete)	-.749	0.561	<0.0001*
'Inhibition' Stroop (time to complete)	-.608	0.369	0.001*

(* = significant at the 0.01 level)

The same correlations were then carried out on the two subgroups, depressed and control groups, independent of each other (see Table 4.). Interestingly, when data for the whole sample was not pooled, the correlations (for shifting and inhibition) were still significant. This indicates that the significant correlations outlined above not only represent the differences in executive functioning abilities of the two subgroups (depressed and control) but also reflect correlations between AMT and EF abilities regardless of depression status. Although of note, the correlations are stronger within the depressed group. This indicates that whilst the relationships between AMT specificity and EF deficits is not dependant on depressive symptomatology it is strengthened by its presence.

Table 4. Correlations between AMT and EF for participant subgroups (depressed and control).

AMT specificity						
	Depressed group			Control Group		
	Correlation	R^2	Sig (2-Tailed)	Correlation	R^2	Sig. (2-tailed)
'Updating' RNG	-.239	0.057	0.249	-.355	0.126	0.213
'Shifting' TrialsB (time to complete)	-.511	0.261	0.009	-.381	0.145	0.038
'Inhibition' Stroop (time to complete)	-.459	0.217	0.042	-.297	0.088	0.047

4.5 Executive Control hypothesis of OGM

It was hypothesized (Hypothesis 4) that the relationship between depression and over general memory would be accounted for by executive functioning abilities. Logistic regression (see Table 5 and Table 6) was used to analyse whether the executive functions of 'shifting' and 'inhibition' could explain the relationship found between overgeneral memory and depression. 'Updating' was not included due to no relationship between 'updating' and either depression or overgeneral memory being found – see above. Logistic regression was used due to the use of a categorical dependent variable (depressed and non depressed participants). Two separate hierarchical logistic regressions were carried out. This was necessary as the correlation between inhibition and shifting (r = 0.671) was highly significant (p = >0.0001) and rendered a model with all three variables unstable.

Firstly, prior to the addition of any EF to the model, the regression model indicated that as overgeneral memory increased the odds of someone having depression increased, OR = 40.0 (3.58, 447.03), p = >0.05. The odds ratio is very high, indicating that it is very likely that a participant displaying high levels of overgeneral memory (low specificity) will also have depression compared to a participant exhibiting low levels of overgeneral memory (high specificity).

Table 5. Logistic Regression with AMT, 'shifting' and Group (depressed or control).

		Logistic Regression		
	Measurement	**ExpB** (Odds Ratio, OR)	**Confidence interval** (CI)	**Sig**. (p)
Memory specifity	AMT	40.00	(3.579, 447.03)	0.003**
'Shifting'	TrailB	1.142	(1.005, 1.299)	0.043*

Adding 'shifting' alone to the regression model (see Table 5) indicates that as time taken to complete Trail B increases (reduced shifting ability), the odds of someone having depression increases, OR = 1.142 (1.01, 1.30) , p = >0.05. Therefore, the odds of a participant displaying high levels of impaired

shifting ability are increased by 14% when the participant is depressed. The confidence interval shows that it is fairly certain that within the wider population the true odds increase will lie between 1% and 30%. In addition, by adding 'shifting' alone to the regression model memory specificity (indicating OGM) now becomes non significant (p = <0.05). This indicates that when the contribution of shifting is controlled for the relationship between depression status and OGM becomes non significant. This suggests that it is likely that the relationship between overgeneral memory and depression can be accounted for by the 'shifting' subset of EF.

Table 6. Logistic Regression with AMT, 'inhibition' and Group (depressed or control).

		Logistic Regression		
	Measurement	**ExpB** (Odds Ratio, OR)	**Confidence interval** (CI)	**Sig**. (p)
Memory specifity	AMT	40.00	(3.579, 447.03)	0.003**
'Inhibition'	Stroop	1.105	(0.996, 1.299)	0.059

In a separate logistic regression, 'inhibition' alone is added to the regression model (see Table 6). The indication is that as time taken to complete the Stroop increases (indicating a deficit in inhibition) the odds of someone having depression increases, OR = 1.11 (0.996, 1.225), p = 0.059, however this has marginally missed out on significance at the 95% level. This, along with the confidence intervals marginally including 0, may indicate that due to the small sample size (N = 29) there was not enough power in the current sample to detect this effect. This may indicate that the reported non –significant result is reflective of low statistical power rather than the effect not actually existing.

5. DISCUSSION

One of the aims of this study was to investigate the relationships between depression, OGM and EF in a depressed older adult population (Hypotheses 1, 2 and 3). This was to better understand the relationships between these three aspects in older adults, and add to the growing literature base.

These findings will be discussed first. The findings attributing to the main aim of the study, investigating evidence for the executive control hypothesis of OGM, will follow.

5.1 Depression and OGM

In this study depressed older adults were found to generate significantly less specific autobiographical memories than their non depressed counterparts. This indicates that depressed older adults, when tested on the AMT, were more likely to generate over-general memories rather than more specific memories. This finding is consistent with previous research on AMT and depression in older adults, that older adults with depression are less specific in their memory retrieval than age-matched controls (for example, Ricarte et al, 2011; Birch and Davidson, 2007).

5.2 Depression and EF

Depressed older adults in this study were found to have significantly greater impairment in aspects of executive functioning compared to those without depression. Depressed participants demonstrated deficits in both the shifting (as measured for by Trail B test) and the inhibition (as tested for by the Stroop test) categories of executive functioning. This finding is consistent with previous research demonstrating deficits in executive functioning in depressed older adults (Richard-Devantay et al., 2012; Rainer et al, 2006; Hermann, Goodwin and Edbmeier, 2007). Updating (as measured for by the RNG test) was not found to be linked with depression in this older adult population. There are few studies from any client group that have investigated the relationship between 'updating' and depression and therefore little to compare this finding to. However recently Snyder (2013) found that although less than 9% of studies included in his large systematic review (which containing over 100 studies) investigated 'updating abilities', participants with major depressive disorder performed significantly worse on updating measures than healthy control participants ($d = 0.63$). The studies included in Snyder's review used the n-back test to measure updating abilities. The n-back test (Kirchner, 1958) is a more cognitively demanding test than the RNG test. Therefore a possible

explanation for this study not finding a relationship between updating and depression could be that the RNG test was not demanding enough on participants updating cognitive abilities to show any effect. The RNG test was chosen over the n-back test in order to reduce demand on participants during what was a relatively length testing procedure.

5.3 OGM and EF

It was hypothesised that individuals who produced more overgeneral memories (therefore demonstrating low AM memory specificity) would also exhibit more deficits in all aspects of EF than those who produced more specific memories (high AM memory specificity). This study found that both inhibition and shifting were found to negatively relate with memory specificity. In other words, the greater the inhibition and shifting deficits a person exhibited, the less specific their memory was. Previous studies, for example in child literature (Raes et al., 2010) have found similar results with respect to OGM and inhibitory control. Williams at al. (2007) suggested that inhibitory processes are closely related to OGM. He stated that 'task errors' on executive functioning tests (such as those found in the Stroop test) exist due to interference from irrelevant information that should have been inhibited. The finding that OGM and inhibition are linked in depressed older adults also fits with Conway and Pleydell-Pearce's (2000) hierarchical autobiographical processing. They stated that memory searches start at a general level (i.e. categorical or extended autobiographical memories), and cued by these general memories individuals can then generate more specific memories, until a specific autobiographical memory is retrieved. Most people navigate through the hierarchy smoothly in order to access the required level of specificity. However, failure to inhibit in the first, early stages of memory retrieval would lead to more general memories being given as answers.

This is only the second study to investigate shifting ability in relation to OGM. The finding that depressed older adults' impaired ability to shift mental sets fits with the known link between rumination and depression. The act of rumination involves thinking at length about the same thoughts or thought processes, in depression this usually means negative or unhelpful thought

processes regarding the individuals distress. Finding it difficult to shift mental sets could indicate why depressed individuals find it difficult to 'shift' away from negative thoughts and therefore engage in rumination. The only other study to investigate shifting abilities in relation to OGM was a recent study by Valentino et al (2012). They found no such link between shifting and OGM, although this study was with depressed children. They suggested this could be due to their use of neutral stimuli (WCST) and not emotional stimuli to test shifting ability, although this study's finding does not support this theory as neutral stimuli were also used here in the form of the TMT.

'Updating', as measured for by the RNG test, was not found to be significantly related to memory specificity. This is contrary to the available literature on updating and OGM (e.g Holland et al, 2012; Piolino et al, 2010). However, Holland et al. (2012), who also used the RNG test as a measure of updating, found that health older adults' recall of specific memories was only significantly related to updating ability in response to neutral cues on the AMT, and not with response to positive or negative emotional cues. They postulated that this was due to an age-related positivity effect, where older people exhibit better memory for positive emotional cues. This may account for the lack of such an effect being found in this study that used the commonly used version of the AMT which contains emotional cue words only.

5.4 EF hypothesis of OGM

The main aim of this study was to investigate the evidence for the executive functioning hypothesis of OGM (including all subcategories of executive functioning – shifting, inhibition and updating), as postulated by Dalgleish and colleagues (2007), within a depressed older adult population.

Shifting ability was found to significantly account for the relationship between depression and OGM in older adults. This finding is contrary to the only other study that has investigated shifting ability in non-clinical sample of older adults (Piolino et al, 2010). This could indicate that 'shifting' plays an

additional role with respect to depressed populations and OGM, over and above any interaction with general aging. There is the possibility that this could be explained by the known deficit in processing speed shown by those with depression (leading to increased response time on Trail B of the TMT), however this seems unlikely as processing speed was controlled for in this study. Another possible reason could be that this study utilised the Trail B test to measure shifting, which considers both *errors* made on the test and *time* to complete the test. Piolino et al (2010) utilised the Wisconsin Card Sort Test (WCST) in their recent study, which took into consideration the perseveration errors but not completion time. It could be that 'shifting' ability *is* impaired, in that it takes someone longer to complete the shifting between mental sets, so this is displayed in increased time, however it is not shown in perseveration errors. This could indicate that although depressed older adults must employ much more effort to switch between mental sets, they can still engage in switching, albeit taking a greater length of time than their non-depressed counterparts. Psychological therapy often requires individuals to shift mental sets (e.g. CBT – thought challenging) and may indicate why depressed individuals often have a poorer prognosis in therapy (Brittlebank et al, 1993). With only two studies investigating shifting ability in relation to OGM and older adults it is impossible to draw any firm conclusions and additional studies are necessary to investigate this further.

Inhibition has been the most widely studied of the subcomponents of EF with respect to OGM. It was hypothesised that depressed older adults tendency towards OGM would be accounted for, at least in part, by their ability to inhibit. Although this study found a trend towards inhibition accounting for depressed older adults OGM, this was not found to be significant. This is in contrast to other studies that have investigated inhibition as the EF hypothesis of OGM (Raes et al, 2010 in depressed children; Piolino et al, 2010, in a healthy older adult population). It is possible that due to the small sample size in this study it was underpowered for small to medium effect sizes and thus did not find an effect for inhibition that could be a true effect (if significant, the effect size would have been medium, $d = 0.41$).

As mentioned previously *updating* was not found to be associated with either depression or OGM and as such was not found to account for the relationship between depression and OGM in older adults. This finding is in contrast to the two previous studies looking at this relationship in older adults (Holland et al, 2012; Piolino et al, 2010), however as discussed this may be due to the reduced sensitivity of the neuropsychological test employed to determine updating ability (RNG test).

6. LIMITATIONS

This study is the first to investigate the executive function control hypothesis of OGM in a depressed older adult population. This study has addressed some of the methodological limitations of previous studies, for example, use of a suitable control group, matched for age, education and cognitive ability, and used validated neuropsychological tests to measure executive functioning abilities rather than relying on self report measures (e.g. Raes et al, 2010). However, in interpreting the results of this study, a number of limitations must be taken into consideration. Only one neuropsychological test per executive functioning ability was administered, for example, when investigating 'shifting' ability, only the TMT was administered to the participants. Although this is common practice in studies measuring EF ability in order to minimise participant burden, (especially in psychiatric populations, Reppermund et al., 2011; Ganguli, Du, Dodge, Ratcliff, and Chang, 2006; Schoepflin-Sanders et al, 2006), this can lead to task impurity. Task impurity can lead to true associations being missed due to the fact that tasks measuring executive functions inherently operate on other cognitive processes (e.g. the TMT, although used to measure switching between mental sets, also relies on visual processing). Therefore deficits shown on one task might not necessarily be due to a deficit in EF as it may be due to deficits in those other cognitive processes necessary to carry out that task. Using multiple tests tapping into the same EF ability can help address this problem (as used in Richard-Devantay et al, 2012; Mackin and Arean, 2009). Another limitation is that the therapist administering the

neuropsychological tests was not blinded to a participant's depression status. This could have introduced an element of bias into the study. A further identified limitation is that the recruited sample size was smaller than intended, leading to the possibility that the study was underpowered with respect to small or medium effect sizes. For example, with the EF ability of inhibition, this comparison may have reached significance had the study had a larger sample, and therefore increased power. The difficulty with recruitment was due to slower rates of referral to the CMHTs than anticipated and practical issues with obtaining clinic space for the study at suitable times. Lastly, multiple comparisons in the analysis were not controlled for.

7. CLINICAL IMPLICATIONS and FUTURE DIRECTIONS

Given that executive functioning abilities (shifting, and possibly inhibition) have been found to account for OGM in this depressed sample of older adults, it might be useful to consider an intervention aimed at improving this population's executive functioning abilities. For example, Cognitive Remediation Therapy (CRT) has been found to be a useful intervention for autobiographical memory deficits in schizophrenia patients (Blairy et al., 2008), perhaps the same could be true of a depressed older adults. A study designed to test for OGM and depression prior to and after a course of CRT (perhaps specifically targeting 'shifting ability) could help ascertain this.

A number of directions for future study have been identified. As this is the first study investigating shifting, inhibition and updating together with respect to the EF hypothesis of OGM in a clinical sample of older adults, there is a need to replicate this study to allow for comparison and to enhance our understanding within this client group. These studies should allow for the methodological concerns outlined above to be addressed; including use of a more cognitively demanding 'updating' task, such as the n-back test; using larger sample sizes; ensuring adequate blinding for

neuropsychological test administrators and using multiple neuropsychological tests per executive functioning ability.

8. CONCLUSIONS

Relationships between depression, OGM and EF in an older adult population were found. Depressed older adults exhibited more executive functioning deficits (in shifting and inhibition) and produce more OGMs than non depressed older adults. There is partial support for the EF hypothesis of OGM in older adults, as shifting ability was found to account for the relationship between depression and OGM. The findings of this study also indicated that inhibition may be a key element in explaining this relationship, although further research is needed to clarify this using larger sample sizes.

9. REFERENCES

- Baddeley, A.D, and Hitch, G. (1974). "Working Memory". In Gordon H. Bower. *The psychology of learning and motivation* (Academic Press). pp. 47–89.
- Belcher, J., and Kangas, M. (2014). Reduced goal specificity is associated with reduced memory specificity in depressed adults. *Cognition and Emotion*, 28, 163-171.
- Birch, L.S. and Davidson, K.M (2007). Specificity of autobiographical memory in depressed older adults and its relationship with working memory and IQ. *British Journal of Clinical Psychology*, 46, 175-186.
- Bjelland, I., Dahl, A.A., Haug, T.T., and Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *Journal of Psychosomatic Research,* 52, 69–77.

- Blairy, S., Neumann, A., Nutthals, F., Pierret, L., Collet, D. and Philippot, P. (2008). Improvements in autobiographical memory of schizophrenia patients after a cognitive intervention: A preliminary study. *Psychopathology*, 41, 388-396.
- Brittlebank, A. D., Scott, J., Williams, J. M. G. and Femer, I. N. (1993). Autobiograpical memory in depression: State or trait marker? *British Journal Of Psychiatry,* 162, 118-121.
- Bruce, M.L., McAvay, G.J., Raue, P.J., Brown, E.L., Meyers, B.S., Keohane, D.J., and Weber, C. (2002). Major depression in elderly home health care patients. *American Journal of Psychiatry*, 159, 1367–1374.
- Butters**,** M.A., Whyte, E.M., Nebes, R.D., Begley, A.E., Dew, M.A., Mulsant, B.H., Zmuda, M.D., Bhalla, R., Meltzer, C.C., Pollock, B.G., Reynolds, C.F.III, and Becker, J.T. (2004). The Nature and Determinants of Neuropsychological Functioning in Late-Life Depression. *Archives of General Psychiatry*, 61, 587-595.
- Caligiuri, M., & Ellwanger, J. (2000). Motor and cognitive aspects of motor retardation in depression. *Journal of Affective Disorders, 57*, 83-93.
- Cohen, J. (1988). Statistical power analysis for the behavioural sciences (2nd Ed) Hillsdale, NJ: Erlbaum.
- Conaghan, S. and Davidson, K.M. (2002). Hopelessness and the anticipation of positive and negative future experiences in older parasuicidal adults. *Journal of Clinical Psychology*, 41, 233-243.
- Conway, M.A. (2003). Commentary: Cognitive-affective mechanisms and processes in autobiographical memory. *Memory*, 11, 217-224.
- Conway, M.A., and Pleydell-Pearce, C.W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, 107, 261-288.
- Dalgleish, T., Williams, J.M.G., Golden, A.M.J., Perkins, N., Barrett, L.F., Barnard, P.J., Au Yeung, C., Murphy, V., Elward, R., Tchanturia, K., and Watkins, E. (2007) Reduced

Specificity of Autobiographical Memory and Depression: The Role of Executive Control. *Journal of Experimental Psychology: General*, 136, 23-42.

- Delis, D.C., Kaplan, E., and Kramer, J.H. (2001). *Delis-Kaplan Executive Function Systems*. San Antonio: TX: Psychological Corporation
- Dozeman, E., van Marwujk, H.W.J., van Schaik, D.J.F., Stek, M.L., van der Horst, H.E., Beekman, A.T.F., and van Hout, H.P. (2010). High incidence of clinically relevant depressive symptoms in vulnerable persons of 75 years or older living in the community. *Aging and Mental Health*, 14, 828-833.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175-191.
- Ganguli, M., Du, Y., Dodge. H.H., Ratcliff, G.G.,Chang, C.H. (2006). Depressive Symptoms and Cognitive Decline in Late Life A Prospective Epidemiological Study. *Archive of General Psychiatry*, 63, 153-160
- Gibbs, L.M., Dombrovski, A.Y., Morse, J., Siegle, G.J., Houck, P.R., and Szanto, K. (2009). When the Solution is Part of the Problem: Problem Solving in Elderly Suicide Attempters. *International Journal of Geriatric Psychiatry*, 24, 1396-1404.
- Haddad, A.D.M, Harmer, C.J., and Williams, J.M.G. (2014) Executive dysfunction and autobiographical memory retrieval in recovered depressed women. *Journal of Behavior Therapy and Experimental Psychiatry*, 45, 260-266.
- Hatfield, J.P., Hirsch, J.K, and Lyness, J.M. (2013). Functional impairment, illness burden, and depressive symptoms in older adults: does type of social relationship matter? *International Journal of Geriatric Psychiatry*, 28, 190-198.
- Hawton, A., Green, C., Dickens, A., Richards, S., Taylor, R., Edwards, R., Greaves, C., and Campbell, J. (2011). The impact of social isolation on the heath status and heatlh-related quality of life of older people. *Quality of Life Research*, 20, 57-67.

- Herrmann, L.L., Goodwin, G.M., Edmeier, K.P (2007). The cognitive neuropsychology of depression in the elderly. *Psychological medicine,* 37, 1693-1702.
- Holland, C.A., Ridout, N., Walford, E., and Geraghty, J. (2012). Executive Function and Emotional Focus in Autobiographical Memory Specificity in Older Adults. *Memory*, 20:8, 779-793.
- Kirchner, W. K. (1958). Age differences in short-term retention of rapidly changing information. *Journal of Experimental Psychology*, 55, 352-358.
- Kuyken, W., and Dalgleish, T. (1995). Autobiographical memory and depression. *British Journal of Clinical Psychology*, 34, 89-92.
- Kvaal, K., McDougall, F.A., Brayne, C., Matthews, F.E., and Dewey, M.E. (2008). Co-occurrence of anxiety and depressive disorders in a community sample of older people: results from the MRC CFAS (Medical Research Council Cognitive Function and Ageing Study) *International Journal of Geriatric Psychiatry*, 23: 229–237.
- Liu, M., Change, Y., Ku, Y., Lee, S., Huang, C., Chen, S. Chen, S., Chu, C., Lui, W. and Lu, R. (2012). Executive functions in elderly men. *Age*, 34, 59-66.
- Lockwood, K.A., Alexopoulos, G.S., and van Gorp, W.G. (2002). Executive dysfunction in Geriatric Depression. *American Journal of Psychiatry*, 159, 1119-1126.
- Lutz, W., Sanderson, W. And Scherbov, S. (2008). The coming acceleration of global population ageing. *Nature*, 451, 716-719.
- Mackin, R.S., and Arean, P.A. (2009). Impaired financial capacity in late life depression is associated with cognitive performance on measures of executive functioning and attention. *Journal of the International Neuropsychological Society*, 15 , 793 – 798 .
- MacPherson, S.E., Phillips, L.H., and Della Sala, S. (2002). Age, executive function, and social decision making: A dorsolateral prefrontal theory of cognitive aging. *Psychology and Aging*, 17, 598–609.

- Mitchell, A.J., and Subramaniam, H. (2005). Prognosis of Depression in Old Age Compared to Middle Age: A Systematic Review of Comparative Studies. *The American Journal of Psychiatry*, 162, 1588-1601.
- Miyake, A., Friedman, N.P., Emerson, M.J., Witzki, A.H., and Howerter. A. (2000). The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. *Cognitive Psychology*, 41, 49-100.
- Monsell, S. (1996). Control of Mental Processes. IN V.Bruce (Ed.), Unsolved mysteries of the mind: Tutorial essays in cognition (pp. 93-148). Hove, UK: Erlbaum.
- Nasreddine, Z.S., Phillips, N.A, Bédirian, V., Charbonneau, S., Whitehead, V., Collin, I., Cummings, J.L., and Chertkow, H. (2005). The Montreal Cognitive Assessment (MoCA©): A Brief Screening Tool For Mild Cognitive Impairment. *Journal of the American Geriatric Society*, 53, 695–699.
- Nebes, R.D., Butters, M.A., Mulsant, B.H., Pollock, B.G., Zmuda, M.D., Houck, P.R., and Reynolds, C.F. (2000). Decreased working memory and processing speed mediate cognitive impairment in geriatric depression. *Psychological Medicine*, 30, 679–691.
- Nolen-Hoeksema, S. (2004). The Response Style Theories. IN Depressive rumination: Nature, theory, and treatment. Papageorgiou, & A. Wells (Eds.), pp. 107–124, Chichester, UK: Wiley.
- Piolino, P., Coste, C., Martinelli, P., Mace, A.L., Quinette, P., Guillery-Girard, B., and Belleville, S. (2010). Reduced specificity of autobiographical memory and aging: Do the executive and feature binding functions of working memory have a role? *Neruopsychologica*, 48, 429-440.
- Potter, G.G., Madden, D.J., Costello, M.C., and Steffens, D.C. (2013) Reduced comparison speed during visual search in late life depression. *Journal of Clinical and Experimental Neuropsychology*, 35, 1060-1070.
- Puffet, A., Jehin-Marchot, D., Timsit-Berthier, M., and Timsit, M. (1991). Autobiographical Memory and Major Depressive States. *European Psychiatry*, 6, 141-145.

- Raes, F., Verstraeten, K., and Bijttebier, P. (2010). Inhibitory control Mediates the Relationship Between Depressed Mood and Overgeneral Memory Recall in Children. *Journal of Clinical Child and Adolescent Psychology*, 39, 276-281.
- Raes, F., Hermans, D., Williams, J.M.G., Beyers, W., Brunfaut, E., and Eelen, P. (2006). Reduced Autobiographical Memory Specificity and Rumination in Predicting the Course of Depression. *Journal of Abnormal Psychology*, 115, 699-704.
- Rainer, M.K., Mucke, H.A.M, Zehetmayer, S., Krampla, W., Kuselbauer, T., Weissgram, S., Jungwirth, S., Tragl, K.H., and Fischer, P. (2006). Data From the VITA Study Do Not Support the Concept of Vascular Depression. *American Journal of Geriatric Psychiatry*, 14, 531–537.
- Rapp, M.A., Dahlman, K. Sano, M., Grossman, H.T., Haroutunian, V., and Gorman, J.M. (2005). Neuropsychological Differences Between Late-Onset and Recurrent Geriatric Major Depression. *The American Journal of Psychiatry*, 162, 691-698.
- Reppermund, S., Brodaty, H., Crawford, J.D., Kochan, N.A., Slavin, M.J., Trollor, J.N., Draper, B., and Sachdev, P.S. (2011). The relationship of current depressive symptoms and past depression with cognitive impairment and instrumental activities of daily living in an elderly population: The Sydney Memory and Ageing Study. *Journal of Psychiatric Research,* 45, 1600-1607.
- Ricarte, J.J., Latorre, J.M., Ros, L., Navarro, B., Aguilar, M.J., and Serrano, J.P. (2011). Overgeneral autobiographical memory effect in older depressed adults. *Aging and Mental Health*, 15, 1028- 1037.
- Richard-Devantoy, S., Jollant, F., Kefi, Z., Turecki, G., Olié, J.P., Annweiler, C., Beauchet, O., and Le Gall, D. (2012). Deficit of cognitive inhibition in depressed elderly: A neurocognitive marker of suicidal risk. *Journal of Affective Disorders*, 140, 193–199.
- Ros, L., Latorre, J.M., and Serrano, J.P. (2010). Working memory capacity and overgeneral autobiographical memory in young and older adults. *Aging, Neuropsychology, and Cognition*, 17, 89-107.

- Schoepflin-Sander, M.L., Lyness, J.M., Eberly, S., King, D.A., and Caine, E.D. (2006) Cerebrovascular Risk Factors, Executive Dysfunction, and Depression in Older Primary Care Patients. *American Journal of Geriatric Psychiatry*, 14, 415-512.
- Schroevers, M.J., Ranchor, A.V., Sanderman, R. (2003). The role of social support and self-esteem in the presence and course of depressive symptoms: a comparison of cancer patients and individuals from the general population. *Social Science Medicine*, 57, 375–385.
- Stroop, J.R. (1935). Studies of Interference in Serial Verbal Reactions. *Journal of Experimental Psychology*, 18, 643-662.
- Sumner, J.A. (2012). The mechanisms underlying overgeneral autobiographical memory: An evaluative review of evidence for the CaR-FA-X model. *Clinical Psychology Review*, 32, 34–48.
- Synder, H.R. (2013). Major Depressive Disorder Is Associated With Broad Impairments on Neuropsychological Measures of Executive Function: A Meta-Analysis and Review. *Psychological Bulletin*, 139, 81-132.
- Towse, J. N., and Neil, D. (1998). Analyzing human random generation behavior: A review of methods used and a computer program for describing performance. *Behavior Research Methods, Instruments and Computers*, 30, 583-591. Program available at http://www.lancs.ac.uk/staff/towse/rgcpage.html
- Tulving, E. (2001). Episodic memory and common sense: How far apart? *Philosophical Transactions of the Royal Society of London B: Biological Sciences*, 356, 1505–1515.
- Valentino, K., Bridgett, D.J., Hayden, L.C., and Nuttall, A.K. (2012). Abuse, Depressive Symptoms, Executive Functioning, and Overgeneral Memory Among a Psychiatric Sample of Children and Adolescents. *Journal of Clinical Child and Adolescent Psychology*, 41, 491-498.
- Vanderhorst, R.K., and McLaren, S. (2005). Social relationships as predictors of depression and suicidal ideation in older adults. *Aging and Mental Health*, 9, 517-525.
- Van Vreeswijk, M.F., and de Wilde, E.J. (2004). Autobiographical memory specificity, psychopathology, depressed mood and the use of the AMT: a meta analysis. *Behaviour Research and Therapy*, 42, 731-743.

- Wecker, N.S., Kramer, J.H., Wisniewski, A., Delis, D.C., and Kaplan, E. (2000). Age effects on executive ability. *Neuropsychology*, 14, 409–414.
- Wessel, I., Merren, M., Peeters, F., Arntz, A. and Merckelbach, H. (2001). Correlates of autobiographical memory specificity: the role of depression, anxiety and childhood trauma. *Behaviour Research and Therapy*, 39, 409-421.
- Williams, J.M.G., Barnhofer, T., Crane, G., Hermans, D., Raes, F., Watkins, E (2007) Autobiographical memory specificity and emotional disorder. *Psychological Bulletin*, 113, 122-148.
- Williams, J.M.G. (2006). Capture and rumination, functional avoidance, and executive control (CaRFAX): Three processes that underlie overgeneral memory. *Cognition and Emotion*, 20, 548-568.
- Wiliams, J.M.G. (1996). Depression and the specificity of autobiographical memory. IN D. C. Rebin (Ed.), *Remembering our past: Studies in autobiographical memory (*pp. 244-267). Cambridge, UK: Cambridge University Press.
- Williams, J. M. G. & Scott, J. (1988). Autobiographical memory in depression. *Psychological Medicine,* 18, 689-695**.**
- Williams, J.M.G. and Broadbent, K. (1986) Autobiographical Memory in Suicide Attempters. *Journal of Abnormal Psychology*, 95, 144-149.
- Zigmond, A.S., Snaith, R.P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica* 67, 361–370.

Chapter 3: Advanced Clinical Practice I Reflective Critical Account (Abstract Only)

Personal reflections on the challenges of multidisciplinary team working in health care settings.

Deirdre Burns*

Full text in Volume II (bound separately)

*Address for correspondence:
Mental Health and Wellbeing
Academic Centre
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow, G12 0XH
Tel: 0141 211 3927

Submitted in partial fulfillment of the requirement for the degree of Doctorate in Clinical Psychology (DClinPsy)

ABSTRACT

Introduction: Within an ever diversifying National Health Service (NHS) multidisciplinary team working has increasingly become an essential part of the role of clinical psychologists. This reflective account explores this role including the challenges it may bring, and personal reflections and experiences of working in such teams.

Reflection: Gibb's Reflective Cycle (1998) is used to structure the reflective account. Initial reflections focus on experiences in inpatient settings early on in the clinical psychology doctoral training pathway, with subsequent reflections dedicated to exploring developing interpersonal skills and subsequent changes in clinical practice. Throughout, there is a focus on communication skills and promoting good working relationships.

Reflective Review: In conclusion, reflections on the process of writing this account are discussed, including the applicability of Gibb's (1998) model, considering alternative methods for reflection, and identifying areas where reflective skill development is still required.

Chapter 4: Advanced Clinical Practice II Reflective Critical Account (Abstract Only)

When The Student Becomes The Teacher – reflections on the experience of training others.

Deirdre Burns*

Full text in Volume II (bound separately)

*Address for correspondence:
Mental Health and Wellbeing
Academic Centre
Gartnavel Royal Hospital
1055 Great Western Road
Glasgow, G12 0XH
Tel: 0141 211 3927

Submitted in partial fulfillment of the requirement for the degree of Doctorate in Clinical Psychology (DClinPsy)

ABSTRACT

Introduction: Psychologists play a key role in disseminating psychological knowledge and skills to other professional groups, both in health settings and in the wider community. This often takes the form of teaching or training other professional staff. This reflective account explores this role including the skills it requires, and personal reflections and experiences of providing such training.

Reflection: Driscoll's (1994) Model of Reflection is used to structure the reflective account. Reflections focus on two personally experienced teaching situations, one that went well and one that did not. Differences between these two experiences are highlighted, and throughout there is a focus on personal and contextual learning points.

Reflective Review: In conclusion, reflections on the process of writing this account are discussed, including thoughts on the development of reflective skills over the course of the last three years.

APPENDICIES

Appendix 1 : Journal submission instructions

Journal of Clinical and Experimental Neuropsychology

Journal of Clinical and Experimental Neuropsychology

This journal uses ScholarOne Manuscripts (previously Manuscript Central) to peer review manuscript submissions. Please read the guide for ScholarOne authors before making a submission. Complete guidelines for preparing and submitting your manuscript to this journal are provided below.

Use these instructions if you are preparing a manuscript to submit to *Journal of Clinical and Experimental Neuropsychology* . To explore our journals portfolio, visit http://www.tandfonline.com/ , and for more author resources, visit our Author Services website.

Journal of Clinical and Experimental Neuropsychology considers all manuscripts on the strict condition that

- the manuscript is your own original work, and does not duplicate any other previously published work, including your own previously published work.
- the manuscript has been submitted only to *Journal of Clinical and Experimental Neuropsychology* ; it is not under consideration or peer review or accepted for publication or in press or published elsewhere.
- the manuscript contains nothing that is abusive, defamatory, libellous, obscene, fraudulent, or illegal.

Please note that *Journal of Clinical and Experimental Neuropsychology* uses CrossCheck™ software to screen manuscripts for unoriginal material. By submitting your manuscript to *Journal of Clinical and Experimental Neuropsychology* you are agreeing to any necessary originality checks your manuscript may have to undergo during the peer-review and production processes.

Any author who fails to adhere to the above conditions will be charged with costs which *Journal of Clinical and Experimental Neuropsychology* incurs for their manuscript at the discretion of *Journal of Clinical and Experimental Neuropsychology* 's Editors and Taylor & Francis, and their manuscript will be rejected.

This journal is compliant with the Research Councils UK OA policy. Please see the licence options and embargo periods here .

Contents List

Open access

Manuscript preparation

1. Journal specific guidelines

- This journal accepts regular (Original) Articles, Review Articles and Critiques.
- There is no word limit for manuscripts submitted to this journal. Authors should include a word count with their manuscript.
- The style and format of the typescripts should conform to the specifications given in the *Publication Manual of the American Psychological Association* (6th ed.).

2. General guidelines

- Manuscripts are accepted in English. American English spelling and punctuation are preferred. Please use double quotation marks, except where "a quotation is 'within' a quotation". Long quotations of words or more should be indented without quotation marks.
- Manuscripts should be compiled in the following order: title page; abstract; keywords; main text; acknowledgements; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figure caption(s) (as a list).
- Abstracts of 100 words are required for all manuscripts submitted.
- **Abstracts .** Authors submitting papers should note that the journal offers a choice to authors to publish either ordinary Abstracts, or Structured Abstracts of between 200-300 words.
  Structured Abstracts have the advantage of being clearer for readers and facilitate better, appropriate indexing and citation of papers, and their essential features are below:
  Introduction : Describe the background to the study, hypotheses, aims, objectives, research questions, etc.
  Method : Include outline of the methodology and design of experiments; materials employed and subject/participant numbers with basic relevant demographic information; the nature of the analyses performed.
  Results : Outline the important and relevant results of the analyses.
  Conclusions : State the basic conclusions and implications of the study. State, clearly and usefully, if there are implications for management, treatment or service delivery.
  Note : Any clinical implications should be clearly stated. Avoid abbreviations, diagrams, and references to the text in the abstract.
- Each manuscript should have up to 5 keywords .
- Search engine optimization (SEO) is a means of making your article more visible to anyone who might be looking for it. Please consult our guidance here .
- Section headings should be concise.
- All authors of a manuscript should include their full names, affiliations, postal addresses, telephone numbers and email addresses on the cover page of the manuscript. One author should be identified as the corresponding author. Please give the affiliation where the research was conducted. If any of the named co-authors moves affiliation during the peer review process, the new affiliation can be given as a footnote. Please note that no changes to affiliation can be made after the manuscript is accepted. Please note that the email address of the corresponding author will normally be displayed in the article PDF (depending on the journal style) and the online article.
- All persons who have a reasonable claim to authorship must be named in the manuscript as co-authors; the corresponding author must be authorized by all co-authors to act as an agent on their behalf in all matters pertaining to publication of the manuscript, and the order of names should be agreed by all authors.
- Biographical notes on contributors are not required for this journal.
- Please supply all details required by any funding and grant-awarding bodies as an Acknowledgement on the title page of the manuscript, in a separate paragraph, as follows:
  - *For single agency grants:* "This work was supported by the [Funding Agency] under Grant [number xxxx]."

  - *For multiple agency grants:* "This work was supported by the [Funding Agency 1] under Grant [number xxxx]; [Funding Agency 2] under Grant [number xxxx]; and [Funding Agency 3] under Grant [number xxxx]."
- Authors must also incorporate a Disclosure Statement which will acknowledge any financial interest or benefit they have arising from the direct applications of their research.
- For all manuscripts non-discriminatory language is mandatory. Sexist or racist terms must not be used.
- Authors must adhere to SI units . Units are not italicised.
- When using a word which is or is asserted to be a proprietary term or trade mark, authors must use the symbol ® or TM.

2. Style guidelines

- Description of the Journal's reference style.
- Guide to using mathematical scripts and equations.
- Word templates are available for this journal. If you are not able to use the template via the links or if you have any other template queries, please contact authortemplate@tandf.co.uk.
- Authors must not embed equations or image files within their manuscript

3. Figures

- Please provide the highest quality figure format possible. Please be sure that all imported scanned material is scanned at the appropriate resolution: 1200 dpi for line art, 600 dpi for grayscale and 300 dpi for colour.
- Figures must be saved separate to text. Please do not embed figures in the manuscript file.
- Files should be saved as one of the following formats: TIFF (tagged image file format), PostScript or EPS (encapsulated PostScript), and should contain all the necessary font information and the source file of the application (e.g. CorelDraw/Mac, CorelDraw/PC).
- All figures must be numbered in the order in which they appear in the manuscript (e.g. Figure 1, Figure 2). In multi-part figures, each part should be labelled (e.g. Figure 1(a), Figure 1(b)).
- Figure captions must be saved separately, as part of the file containing the complete text of the manuscript, and numbered correspondingly.
- The filename for a graphic should be descriptive of the graphic, e.g. Figure1, Figure2a.

4. Publication charges

Submission fee - There is no submission fee for *Journal of Clinical and Experimental Neuropsychology* .

Page charges - There are no page charges for *Journal of Clinical and Experimental Neuropsychology* .

Colour charges - Colour figures will be reproduced in colour in the online edition of the journal free of charge. If it is necessary for the figures to be reproduced in colour in the print version, a charge will apply. Charges for colour figures in print are £250 per figure ($395 US Dollars; $385 Australian Dollars; 315 Euros). For more than 4 colour figures, figures 5 and above will be charged at £50 per figure ($80 US Dollars; $75 Australian Dollars; 63 Euros).Depending on your location, these charges may be subject to Value Added Tax .

5. Reproduction of copyright material

If you wish to include any material in your manuscript in which you do not hold copyright, you must obtain written permission from the copyright owner, prior to submission. Such material may be in the form of text, data, table, illustration, photograph, line drawing, audio clip, video clip, film still, and screenshot, and any supplemental material you propose to include. This applies to direct (verbatim or facsimile) reproduction as well as "derivative reproduction" (where you have created a new figure or table which derives substantially from a copyrighted source).

You must ensure appropriate acknowledgement is given to the permission granted to you for reuse by the copyright holder in each figure or table caption. You are solely responsible for any fees which the copyright holder may charge for reuse.

The reproduction of short extracts of text, excluding poetry and song lyrics, for the purposes of criticism may be possible without formal permission on the basis that the quotation is reproduced accurately and full attribution is given.

For further information and FAQs on the reproduction of copyright material, please consult our Guide .

6. Supplemental online material

Authors are encouraged to submit animations, movie files, sound files or any additional information for online publication.

- Information about supplemental online material

Manuscript submission

All submissions should be made online at the *Journal of Clinical and Experimental Neuropsychology* Scholar One Manuscripts website. New users should first create an account. Once logged on to the site, submissions should be made via the Author Centre. Online user guides and access to a helpdesk are available on this website. Manuscripts may be submitted in any standard editable format, including Word and EndNote. These files will be automatically converted into a PDF file for the review process. LaTeX files should be converted to PDF prior to submission because ScholarOne Manuscripts is not able to convert LaTeX files into PDFs directly. All LaTeX source files should be uploaded alongside the PDF.

Click here for information regarding anonymous peer review.

Copyright and authors' rights

To assure the integrity, dissemination, and protection against copyright infringement of published articles, you will be asked to assign us, via a Publishing Agreement, the copyright in your article. Your Article is defined as the final, definitive, and citable Version of Record, and includes: (a) the accepted manuscript in its final form, including the abstract, text, bibliography, and all accompanying tables, illustrations, data; and (b) any supplemental material hosted by Taylor & Francis. Our Publishing Agreement with you will constitute the entire agreement and the sole understanding between you and us; no amendment, addendum, or other communication will be taken into account when interpreting your and our rights and obligations under this Agreement. Copyright policy is explained in detail here .

Free article access

As an author, you will receive free access to your article on Taylor & Francis Online. You will be given access to the *My authored works* section of Taylor & Francis Online, which shows you all your published articles. You can easily view, read, and download your published articles from there. In addition, if someone has cited your article, you will be able to see this information. We are committed to promoting and increasing the visibility of your article and have provided guidance on how you can help . Also within *My authored works* , author eprints allow you as an author to quickly and easily give anyone free access to the electronic version of your article so that your friends and contacts can read and download your published article for free. This applies to all authors (not just the corresponding author).

Reprints and journal copies

Corresponding authors can receive a complimentary copy of the issue containing their article. Article reprints can be ordered through Rightslink® when you receive your proofs. If you have any queries about reprints,

please contact the Taylor & Francis Author Services team at reprints@tandf.co.uk . To order a copy of the issue containing your article, please contact our Customer Services team at Adhoc@tandf.co.uk

Open Access

Taylor & Francis Open Select provides authors or their research sponsors and funders with the option of paying a publishing fee and thereby making an article permanently available for free online access – *open access* – immediately on publication to anyone, anywhere, at any time. This option is made available once an article has been accepted in peer review.

Full details of our Open Access programme

Last updated 11/03/2014

Taylor and Francis Group – Standard Reference Style - APA

APA (American Psychological Association) references are widely used in the social sciences, education, engineering and business. For detailed information, please see the *Publication Manual of the American Psychological Association*, 6th edition, http://www.apastyle.org/ and http://blog.apastyle.org/.

Contents of this guide

In the text	
Placement	References are cited in the text by the author's surname, the publication date of the work cited, and a page number if necessary. Full details are given in the reference list. Place them at the appropriate point in the text. If they appear within parenthetical material, put the year within commas: (see Table 3 of National Institute of Mental Health, 2012, for more details)
Within the same parentheses	Order alphabetically and then by year for repeated authors, with in-press citations last.

	Separate references by different authors with a semi-colon.
Repeat mentions in the same paragraph	If name and year are in parentheses, include the year in subsequent citations.
With a quotation	This is the text, and Smith (2012) says "quoted text" (p. 1), which supports my argument. This is the text, and this is supported by "quoted text" (Smith, 2012, p. 1). This is a displayed quotation. (Smith, 2012, p. 1)
Page number	(Smith, 2012, p. 6)
One author	Smith (2012) or (Smith, 2012)
Two authors	Smith and Jones (2012) or (Smith & Jones, 2012)
Three to five authors	At first mention: Smith, Jones, Khan, Patel, and Chen (2012) or (Smith, Jones, Khan, Patel, & Chen, 2012) At subsequent mentions: Smith et al. (2012) or (Smith et al., 2012) In cases where two or more references would shorten to the same form, retain all three names.
Six or more authors	Smith et al. (2012) (Smith et al., 2012)
Authors with same surname	G. Smith (2012) and F. Smith (2008) G. Smith (2012) and F. Smith (2012)
No author	Cite first few words of title (in quotation marks or italics depending on journal style for that type of work), plus the year: ("Study Finds," 2007) If anonymous, put (Anonymous, 2012).
Groups of authors that would shorten to the same form	Cite the surnames of the first author and as many others as necessary to distinguish the two references, followed by comma and et al.
Organization as	The name of an organization can be spelled out each time

author	it appears in the text or you can spell it out only the first time and abbreviate it after that. The guiding rule is that the reader should be able to find it in the reference list easily. National Institute of Mental Health (NIMH, 2012) or (National Institute of Mental Health [NIMH], 2012) University of Oxford (2012) or (University of Oxford, 2012)
Author with two works in the same year	Put a, b, c after the year (Chen, 2011a, 2011b, in press-a)
Secondary source	When it is not possible to see an original document, cite the source of your information on it; do not cite the original assuming that the secondary source is correct. Smith's diary (as cited in Khan, 2012)
Classical work	References to classical works such as the Bible and the Qur'an are cited only in the text. Reference list entry is not required. Cite year of translation (Aristotle, trans. 1931) or the version you read: Bible (King James Version).
Personal communication	References to personal communications are cited only in the text: A. Colleague (personal communication, April 12, 2011)
Unknown date	(Author, n.d.)
Two dates	(Author, 1959–1963) Author (1890/1983)
Notes	Endnotes should be kept to a minimum. Any references cited in notes should be included in the reference list.
Tables and figures	Put reference in the footnote or legend.
Reference list	
Order	Alphabetical letter by letter, by surname of first author followed by initials. References by the same single author

Issued 2007; Revised 25 January 2013. Changes in this revision: more guidance on providing URLs. Revised 1 April 2014. Changes in this revision: more info on multivolume works and on titles not in English.

	are ordered by date, from oldest to most recent. References by more than one author with the same first author are ordered after all references by the first author alone, by surname of second author, or if they are the same, the third author, and so on. References by the same author with the same date are arranged alphabetically by title excluding 'A' or 'The', unless they are parts of a series, in which case order them by part number. Put a lower-case letter after the year: Smith, J. (2012a). Smith, J. (2012b). For organizations or groups, alphabetize by the first significant word of their name. If there is no author, put the title in the author position and alphabetize by the first significant word.
Form of author name	Use the authors' surnames and initials unless you have two authors with the same surname and initial, in which case the full name can be given: Smith, J. [Jane]. (2012). Smith, J. [Joel]. (2012). If a first name includes a hyphen, add a full stop (period) after each letter: Jones, J.-P.
Book	
One author	Author, A. A. (2012). *This is a book title: And subtitle*. Abingdon: Routledge.
Two authors	Author, A. A., & Author, B. B. (2012). *This is a book title: And subtitle*. Abingdon: Routledge.
Three authors	Author, A. A., Author, B. B., & Author, C. C. (2012). *This is a book title: And subtitle*. Abingdon: Routledge.
More authors	Include all names up to seven. If there are more than seven authors, list the first six with an ellipsis before the last. Author, M., Author, B., Author, E., Author, G., Author, D., Author, R., … Author, P. (2001).
Organization as author	American Psychological Association. (2003). *Book title: And subtitle.* Abingdon: Routledge.

No author	*Merriam Webster's collegiate dictionary* (10th ed.). (1993). Springfield, MA: Merriam-Webster.
Chapter	Author, A. A. (2012). This is a chapter. In J. J. Editor (Ed.), *Book title: And subtitle* (pp. 300–316). Abingdon: Routledge. Author, A. A. (2012). This is a chapter. In J. J. Editor & B. B. Editor (Eds.), *Book title: And subtitle* (pp. 300–316). Abingdon: Routledge. Author, A. A. (2012). This is a chapter. In J. J. Editor, P. P. Editor, & B. B. Editor (Eds.), *Book title: And subtitle* (pp. 300–316). Abingdon: Routledge.
Edited	Editor, J. J. (Ed.). (2012). *Book title: And subtitle.* Abingdon: Routledge. Editor, J. J., Editor, A. A., & Editor, P. P. (Eds.). (2012). *Book title: And subtitle.* Abingdon: Routledge. Editor, J. J., & Editor, P. P. (Eds.). (2012). *Edited online book: And subtitle*. Retrieved from http://www.xxxxxx
Edition	Author, A. A. (2012). *Book title: And subtitle* (4th ed.). Abingdon: Routledge.
Translated	Author, J. J. (2012). *Book title: And subtitle*. (L. Khan, Trans.). Abingdon: Routledge.
Not in English	Piaget, J., & Inhelder, B. (1951). *La genèse de l'idée de hasard chez l'enfant* [The origin of the idea of chance in the child]. Paris: Presses Universitaires de France.
Online	Author, A. A. (2012). *Title of work: Subtitle* [Adobe Digital Editions version]. Retrieved from http://www.xxxxxx
Place of publication	Always list the city, and include the two-letter state abbreviation for US publishers. There is no need to include the country name: New York, NY: McGraw-Hill Washington, DC: Author Newbury Park, CA: Sage Pretoria: Unisa Chicago, IL: University of Chicago Press

	Cambridge, MA: Harvard University Press Abingdon: Routledge If the publisher is a university and the name of the state is included in the name of the university, do not repeat the state in the publisher location: Santa Cruz: University of California Press Lincoln: University of Nebraska Press
Publisher	Give the name in as brief a form as possible. Omit terms such as 'Publishers', 'Co.', 'Inc.', but retain the words 'Books' and 'Press'. If two or more publishers are given, give the location listed first or the location of the publisher's home office. When the author and publisher are identical, use the word Author as the name of the publisher.
Multivolume works	
Multiple volumes from a multi-volume work	Levison, D., & Ember, M. (Eds). (1996). *Encyclopedia of cultural anthropology* (Vols. 1-4). New York, NY: Henry Holt. Use Vol. for a single volume and Vols. for multiple volumes. In text, use (Levison & Ember, 1996).
A single volume from a multi-volume work	Nash, M. (1993). Malay. In P. Hockings (Ed.), *Encyclopedia of world cultures* (Vol. 5, pp. 174-176). New York, NY: G.K. Hall. In text, use (Nash, 1993).
Journal	
One author	Author, A. A. (2011). Title of article. *Title of Journal, 22*,

	123–231. doi:xx.xxxxxxxxxx Provide the issue number ONLY if each issue of the journal begins on page 1. In such cases it goes in parentheses: *Journal, 8*(1), pp–pp. Page numbers should always be provided. If there is no DOI and the reference was retrieved from an online database, give the database name and accession number or the database URL (no retrieval date is needed): Author, A. A. (2011). Title of article. *Title of Journal, 22*, 123–231. Retrieved from http://www.xxxxx If there is no DOI and the reference was retrieved from a journal homepage, give the full URL or site's homepage URL: Author, A. A. (2011). Title of article. *Title of Journal, 22*, 123–231. Retrieved from http://www.xxxxx
Two authors	Author, A. A., & Author, B. B. (2004). Title of article. *Title of Journal, 22*, 123–231. doi:xx.xxxxxxxxxx
Three authors	Author, A. A., Author, B. B., & Author, C. C. (1987). Title of article. *Title of Journal, 22*, 123–231. doi:xx.xxxxxxxxxx
More authors	Include all names up to seven. If there are more than seven authors, list the first six with an ellipsis before the last. Author, M., Author, B., Author, E., Author, G., Author, D., Author, R., … Author, P. (2001).
Organization as author	American Psychological Association. (2003). Title of article: And subtitle. *Title of Journal, 2*, 12–23. doi:xx.xxxxxxxxxx
No author	Editorial: Title of editorial. [Editorial]. (2012). *Journal Title, 14*, 1–2.
Not in English	If the original version is used as the source, cite the original version. Use diacritical marks and capital letters

Issued 2007; Revised 25 January 2013. Changes in this revision: more guidance on providing URLs. Revised 1 April 2014. Changes in this revision: more info on multivolume works and on titles not in English.

	for the original language if needed. If the English translation is used as the source, cite the English translation. Give the English title without brackets. Titles not in English must be translated into English and put in square brackets. Author, M. (2000). Title in German [Title in English]. *Journal in German, 21,* 208–217. doi:xx.xxxxxxxxxx
Peer-reviewed article published online ahead of the issue	Author, A. A., & Author, B. B. (2012). Article title. *Title of Journal*. Advance online publication. doi:xx.xxxxxxxxxx If you can update the reference before publication, do so.
Supplementary material	If you are citing supplementary material which is only available online, include a description of the contents in brackets following the title. [Audio podcast] [Letter to the editor]
Other article types	Editorial: Title of editorial. [Editorial]. (2012). *Title of Journal, 14*, 1–2. Author, A. A. (2010). Title of review. [Review of the book *Title of book*, by B. Book Author]. *Title of Journal, 22*, 123–231. doi:xx.xxxxxxxxxx
Conference	
Proceedings	To cite published proceedings from a book, use book format or chapter format. To cite regularly published proceedings, use journal format.
Paper	Presenter, A. A. (2012, February). *Title of paper*. Paper presented at the meeting of Organization Name, Location.
Poster	Presenter, A. A. (2012, February). *Title of poster*. Poster session presented at the meeting of Organization Name, Location.
Thesis	
	Author, A. A. (2012). *Title of thesis* (Unpublished doctoral dissertation or master's thesis). Name of Institution, Location.

Issued 2007; Revised 25 January 2013. Changes in this revision: more guidance on providing URLs. Revised 1 April 2014. Changes in this revision: more info on multivolume works and on titles not in English.

Unpublished work	
Manuscript	Author, A. A., Author, B. B., & Author, C. C. (2008). *Title of manuscript*. Unpublished manuscript. Author, A. A., Author, B. B., & Author, C. C. (2012). *Title of manuscript*. Manuscript submitted for publication.
Forthcoming article	Author, A. A., Author, B. B., & Author, C. C. (in press). Title of article. *Title of Journal*. doi:xx.xxxxxxxxx
Forthcoming book	Author, A. A. (in press). *Book title: Subtitle.*
Internet	
Website	When citing an entire website, it is sufficient just to give the address of the site in the text. The BBC (http://www.bbc.co.uk).
Web page	If the format is out of the ordinary (e.g. lecture notes), add a description in brackets. Author, A. (2011). Title of document [Format description]. Retrieved from http://URL
Newspaper or magazine	
	Author, A. (2012, January 12). Title of article. *The Sunday Times*, p. 1. Author, A. (2012, January 12). Title of article. *The Sunday Times*. Retrieved from http://www.sundaytimes.com Title of article. (2012, January 12). *The Sunday Times*. Retrieved from http://www.sundaytimes.com/xxxx.html
Report	
	Author, A. A. (2012). *Title of work* (Report No. 123). Location: Publisher.

Issued 2007; Revised 25 January 2013. Changes in this revision: more guidance on providing URLs. Revised 1 April 2014. Changes in this revision: more info on multivolume works and on titles not in English.

	Author, A. A. (2012). *Title of work* (Report No. 123). Retrieved from Name website: http://www.xxxxxxxx.pdf
Personal communication	
	Personal communication includes letters, emails, memos, messages from discussion groups and electronic bulletin boards, personal interviews. Cite these only in the text. Include references for archived material only.
Other reference types	
Patent	Cho, S. T. (2005). *U.S. Patent No. 6,980,855*. Washington, DC: U.S. Patent and Trademark Office.
Map	London Mapping Co. (Cartographer). (1960). Street map. [Map]. Retrieved from http://www.londonmapping.co.uk/maps/xxxxx.pdf
Act	Mental Health Systems Act, 41 U.S.C. § 9403 (1988).
Audio and visual media	Taupin, B. (1975). Someone saved my life tonight [Recorded by Elton John]. On *Captain fantastic and the brown dirt cowboy* [CD]. London: Big Pig Music Limited. Author, A. (Producer). (2009, December 2). *Title of podcast* [Audio podcast]. Retrieved from http://www.xxxxx.com Producer, P. P. (Producer), & Director, D. D. (Director). (Date of publication). *Title of motion picture* [Motion picture]. Country of origin: Studio or distributor. Smith, A. (Writer), & Miller, R. (Director). (1989). Title of episode [Television series episode]. In A. Green (Executive Producer), *Series*. New York, NY: WNET. Miller, R. (Producer). (1989). *The mind* [Television series]. New York, NY: WNET.

Issued 2007; Revised 25 January 2013. Changes in this revision: more guidance on providing URLs. Revised 1 April 2014. Changes in this revision: more info on multivolume works and on titles not in English.

Database	Author, A. A., Author, B. B., & Author, A. A. (2002). A study of enjoyment of peas. *Journal Title, 8*(3). Retrieved February 20, 2003, from the PsycARTICLES database.
Dataset	Author. (2011). *National Statistics Office monthly means and other derived variables* [Data set]. Retrieved March 6, 2011, from http://www.xxxxx.com If the dataset is updated regularly, use the year of retrieval in the reference, and using the retrieval date is also recommended.
Computer program	Rightsholder, A. A. (2010). Title of program (Version number) [Description of form]. Location: Name of producer. Name of software (Version Number) [Computer software]. Location: Publisher. If the program can be downloaded or ordered from a website, give this information in place of the publication information.

Issued 2007; Revised 25 January 2013. Changes in this revision: more guidance on providing URLs. Revised 1 April 2014. Changes in this revision: more info on multivolume works and on titles not in English.

Appendices : Systematic Review

(2.1 - 2.2)

Appendix 2.1 : Data Extraction Sheet

DATA CAPTURE FORM

Lead Author		
Year		
Title		
Journal		

	What are the study aims/hypotheses?
	What are the eligibility criteria? Inclusion Exclusion
Recruitment	
	- How were participants recruited in Depressed group? Convenience sample Geographic cohort Highly selective sample - How were participants recruited in Control group? Convenience sample Geographic cohort Highly selective sample
	- Number of participants recruited? Depressed Control

	- Statistical Power? - Non-participant data reported?	
Participants	**Depressed group** Mean age and SD: Gender ratio: Duration of illness: Medication: Other:	**Control group** Mean age and SD: Gender ratio: Other:
	Were groups matched by key characteristics?	
	Groups treated the same?	
Depression (tools used)	Self report? Diagnostic? Name:	
Executive Functioning (tests used)	Inhibition? Updating? Switching? Other?	

Data Analysis	Means and SD given for both groups?		
	Type of analysis?		
	Drop outs?, and if so, how managed?		
Results	EF test (effect size?)	Depressed (m)	Control (m)
	Inhibition		
	Updating		
	Shifting		
Effect size	Given? Or have to calculate?		
Conclusion			
Other			

Appendix 2.2 : Quality Rating Scale

Quality Rating Scale

Article Number		
Author And Year		
Journal		
Title		
Assessor		
		Score
Selection of Participants	**1.1 What was the method of recruitment used?** Geographic cohort = 4 Convenience sample = 2 Highly selective sample / Not stated = 0	
	1.2 Were inclusion criteria stated? Yes = 1 No = 0	
	1.3 Were exclusion criteria stated? Yes = 1 No / Did not have exclusion criteria = 0	
	1.4 Was data reported on non participation? Yes = 1 No = 0	
	1.5 How was the existence of depression determined? Yes – clinician scale used = 2 Yes – self report measure used = 1 No = 0	
	1.6 Was a measure of current symptom severity reported? Yes = 1 No = 0	
	1.7 Were the medications that participants were currently taking reported? Yes = 1 No = 0	
	1.8 Was co-morbidity of other psychiatric illness controlled for? (e.g. anxiety?) Yes = 2 Partially (not including anxiety) = 1 No = 0	
	1.8 Was age of participants recorded? Mean age and age range reported = 2 Mean age reported = 1 No = 0	
Assessment of Executive Functioning	**2.1 Were the EF tests used that are reliable and valid?** Yes, all = 2 Yes, some = 1 No / Not adequately described/ Specificity not measured= 0	

	2.2 Were multiple measures used to assess same EF? Yes = 2 No = 0	
	2.3 Were the way the EF tests were utilised (e.g. outcome scores) adequately described to allow for exact replication? Yes = 2 Only partially = 1 No = 0	
	2.4 Were assessors blind to participant group allocation? Yes = 1 No / Not reported = 0	
	2.5 Was a suitable control task utilized (e.g. psychomotor speed task?) Yes = 2 No/Not reported = 0	
Method and Design	**3.1 Were aims/hypotheses explicitly stated?** Yes = 1 No = 0	
	3.2 Was a control group used? Non-clinical comparison group = 2 Clinical comparison group= 1 No comparison group = 0	
	3.3 Was statistical power sufficient? Yes = 2 No / Not reported = 0	
	3.4 Were between group comparisons made between those with depression and those without? Yes = 1 No = 0	
	3.5 Were attempts made to match those with depression and those without for between group comparisons (e.g. age, education, gender etc.) Yes = 2 Some attempt = 1 No = 0	
	3.6 Was there equivalent treatment of those with depression and those without? Yes = 1 No / Unclear = 0	
	3.7 Were attempts made to control for the effects of general cognitive functioning (e.g. MMSE)? Yes = 2 No = 0	
Analysis	**4.1 Was the analysis appropriate to the design and type of outcome measures?** Yes = 2 No = 0	

	4.2 Was data for dropouts appropriately managed? Yes = 1 No / Not reported = 0	
	4.3 Confidence intervals, effect sizes, p-values etc are provided were appropriate? Yes = 2 Yes, but only partially = 1 No = 0	
		TOTAL SCORE / 40
		Percentage = %
		Quality Rating 0-50% Poor 51 – 60% Acceptable 61 – 70% Good 71 – 80% Excellent 81% + Exceptional

Appendicies : Major Research Project

(3.1 – 3.6)

Appendix 3.1 : Participant Information Sheet

Participant Information Sheet

Invitation to participate in research investigating the link between memory and mood in older people

Chief Investigator:
Deirdre Burns, Trainee Clinical Psychologist

Research Supervisor:
Prof. Kate Davidson

For further information please contact: Deirdre Burns, xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.
Telephone: xxxxxxxxxxxxxx Email: xxxxxxxxxxxxxxxx

What is this information about?

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask our team if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Background and Purpose

I am training to be a Clinical Psychologist and currently attend the University of Glasgow for teaching, in addition to working within NHS Lanarkshire. As part of my training I am conducting this research project to help clinicians gain a better understanding of individuals' problems and how to help them.

This project is interested in looking at how people's memory and other thinking skills relate to each other. We are also interested in looking at whether there are differences between these two things in people currently experiencing depression and those who are not.

If you take part you will be asked to complete a series of short tasks that will test your thinking skills, and a questionnaire on how you have been feeling in the last two weeks. The purpose of the study is to develop a greater understanding of how differences in thinking skills can affect the way older people recall memories from the past. It is hoped that understanding this better will lead to improved care in the future for older people.

Why have I been invited?
We believe this is a suitable study for you, if you would like to take part. You have been identified as you are over 65 years of age, and are not currently attending a mental health service.

Do I have to take part?
No, it is up to you to decide whether or not to take part. Participating in this study is completely voluntary and you are not under any obligation to consent. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form, which you will also get a copy of. If you decide to take part you are still free to withdraw at any time and without giving a reason. This will not affect the service you receive from the NHS.

What will happen to me if I take part?

If you decide to take part in the study we will arrange a time that suits you to attend to participate. You will have a chance to talk about the study with the researcher and if you are happy to go ahead you will then sign a consent form.

You will then complete a brief health questionnaire and another about how you have been feeling in the last two weeks. You will then be asked to recall some memories from your past, and complete the tests that look at your thinking skills. These tests either require you to answer questions verbally (some of which will be recorded on a voice recorder for scoring purposes), or are pen and paper based. The whole process is likely take about an hour to complete. You will only need to meet with the researcher on this one occasion to participate.

What are the possible disadvantages and risks of taking part?

There are not thought to be any risks or disadvantages in taking part. However, if you feel distressed at any time during the interview you will have the option to stop.

When you complete some of the tests it might become apparent to the researcher that you may be experiencing low mood or memory difficulties. If this is the case we will inform you of this and let you know of relevant services that you might find useful at this time. The answers you provide will then be grouped with those participants who are also experiencing low mood.

What are the possible benefits of taking part?

We cannot promise the study will help you directly, but it is also hoped that this research will improve our understanding of later life depression and therefore influence the care of those with such difficulties in the future.

What if something goes wrong?

We do not anticipate any harms or risks from taking part in this study. However, if you have any concerns or complaints regarding the way this research has been conducted or the way you have been tested, you can contact us at any time.

You can also contact the NHS Complaints Communications Service by post, email or telephone (Communications Headquarters, National Services Scotland, Gyle Square, 1 South Gyle Crescent, Edinburgh, EH12 9EB. Telephone - 0131 275 6000

E-mail - nss.communications@nhs.net)

Will my taking part in this study be kept confidential?

All information which is collected about you during the course of the research will be kept strictly confidential. Any data that you have provided will have your name and address removed so that you cannot be recognised from it.

If you join the study some parts of the information gathered may be looked at by authorised people to check that the research is being carried out correctly.

What will happen to the results of the research study?

The results will be written up as part of a Doctoral programme in Clinical Psychology. In all cases, including publication of the study, your name and personal details will not be identified.

Who is organising the research?

The study is being organised by Deirdre Burns, a Doctorate student from the University of Glasgow. This is in collaboration with Prof Kate Davidson from the University of Glasgow and Dr. Clive Ferenbach from NHS Lanarkshire.

Who has reviewed the study?

All research in the NHS is looked at by an independent group of people, called a Research Ethics Committee, to protect your interests. This study has been reviewed and given a favorable opinion by the West of Scotland Research Ethics Committee.

This study has also been reviewed by Doctorate in Clinical Psychology staff at the University of Glasgow.

Contact for further information

If you wish to ask anything further, please contact Deirdre Burns via telephone, email or post using the contact details at the start of this information sheet.

Thank you for reading this information sheet. You will be given a copy to keep. If you have understood the contents of this sheet and wish to take part, please complete the consent sheet on the next page.

Appendix 3.2 : Participant Consent Form

Participant Identification Number for this trial:

Consent form

Title of Project: Over General Memory in Depressed Older Adult population: The role of executive functioning.

Name of Chief Investigator: Deirdre Burns

(For further information please contact: Deirdre Burns, xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx. Telephone: xxxxxxxxxx Email: xxxxxxxxxxxxxxxxxx)

		Please *initial* the box
1.	I confirm that I have read the information sheet dated November 2013 (version 2.0) the above study.	☐
2.	I have had a chance to discuss this study and ask questions.	☐
3.	I have received satisfactory answers to all of my questions.	☐
4.	I have received enough information about the study	☐
5.	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected.	☐

6. I understand and consent to some of my verbal answers to the tests to be recorded on a digital voice recorder for scoring purposes (all quotes will be anonymous). ☐

7. I agree to take part in the above study ☐

| --- | --- | --- |
| Name of Participant | Date | Signature |

| --- | --- | --- |
| Name of Person taking consent | Date | Signature |

If, when the study is finished, you would like to receive a short summary of the study findings please write your postal address below.

Appendix 3.3 : Ethics Committee Letter of Approval I

NHS
Greater Glasgow and Clyde

WoSRES
West of Scotland Research Ethics Service

West of Scotland REC 5
Ground Floor - Tennent Building
Western Infirmary
38 Church Street
Glasgow
G11 6NT

Mrs Deirdre Burns
xxxxxxxx
xxxxxxx
xxxx

Date 29 October 2013

Direct line 0141 211 2102
E-mail WoSREC5@ggc.scot.nhs.uk

Dear Mrs Burns

Study title: **Over general memory in a depressed older adult population: the role of executive functioning**
REC reference: **13/WS/0268**
IRAS project ID: **137120**

The Research Ethics Committee reviewed the above application at the meeting held on 16 October 2013. Thank you for attending to discuss the application.

We plan to publish your research summary wording for the above study on the NRES website, together with your contact details, unless you expressly withhold permission to do so. Publication will be no earlier than three months from the date of this favourable opinion letter. Should you wish to provide a substitute contact point, require further information, or wish to withhold permission to publish, please contact the Co-ordinator Mrs Sharon Macgregor, WoSREC5@ggc.scot.nhs.uk.

Ethical opinion

1) The Committee asked the Researcher to explain the selection process. The Researcher advised that there would be two groups - a Control Group and Depressed Group. For the NHS Patients the Researcher would approach the Community Mental Health Teams and ask the Clinicians to identify suitable participants from their caseload. The Clinicians would then introduce the study to the potential participants and give them a Participant Information Sheet. The potential participants would have an opportunity to read the Information Sheet and if interested they would be able to telephone the Researcher to discuss further. The Clinician will also prompt patients about the study at their next appointment and also obtain contact details to pass to the Researcher. For the Control Group the Researcher would approach voluntary organisations and other groups for Older Adults such as Lunch Clubs etc. The Researcher would then go to the Clubs, explain what the study is about and then have a questions and answers session. Those interested would be give a Participant Information Sheet to take away and then if they would like further information they could telephone the Researcher.

1) The Committee noted that there would be two groups of 21 and asked how they would be chosen, i.e. would they be randomised. The Researcher explained that she would recruit as they come and once 21 had been achieved she would stop.

2) The Committee asked how the Researcher would differentiate between the Controls and Patients. The Researcher advised that she would carry out the depression score and if the person did not meet the cut-off score for depression as measured by the HADS and MOCA then that person would not be included in the study.

3) The Committee referred to the T-Tests mentioned in A62 of the Application Form commenting that if a 2 tail test is used then the number of participants should be 26. The Committee asked the Researcher to review this and suggested that 26 participants be recruited. The Committee strongly suggested that 26 participants should be recruited to avoid under-powering the study.

4) The Committee commented that the 'header' on the PIS for the Control Group stated 'patient' and required to either be deleted or changed to 'participant'.

5) The Committee commented that some older adults may be depressed but did not realise this and that there was nothing the Participant Information Sheet to say what they should do if this becomes apparent. The Researcher commented that she would keep on testing and the data would go into the depressed group. She would also give feedback to the individual and recommend that they speak to their GP or signpost to the relevant disciplines.

6) The Committee agreed that the language in the Participant Information Sheet required to be simplified. Words such as 'brain functioning abilities' and 'retrieve memories' should be explained.

7) The Committee noted that the timeframe for completion of the questionnaires was 90 minutes and wondered whether participants would be offered a break if needed. The Researcher advised that 90 minutes was the top estimate of how long it would take to complete the questionnaires and participants would be encouraged to take a break if required.

8) The Committee asked how the data would be kept anonymous. The Researcher advised that their personal details would be kept separate from the test result and there would be a participant identifier to ensure confidentiality. The participant identifier would be included on the personal data sheet for those participants wishing feedback to allow the address to be found.

9) The Committee noted that some controls may be transferred to the depressed group due to their HADS score and asked the Researcher if she would tell them about this. The Researcher commented that she did not see this as an issue as some may be on medication and others not. The Committee agreed that there should be a sentence added to the PIS informing the Controls that this could happen.

The members of the Committee present gave a favourable ethical opinion of the above research on the basis described in the application form, protocol and supporting documentation, subject to the conditions specified below.

Ethical review of research sites

NHS Sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

1) The Participant Information Sheets for both patients and controls require to be amended as follows:

a) Contact details should be at the beginning
b) The header in the PIS for the Control Group, i.e. Patient, should either be deleted or changed to 'Participant'.
c) The language should be simplified
d) At 'Do I have to take part' the first word should be 'No'.
e) At 'What will happen to me if I take part' a sentence should be added to state that some of the verbal answers to the tests will be recorded on a digital voice recorder for scoring purposes.
f) At 'What are the possible disadvantages and risks of taking part' a sentence should be added stating what action will be taken, i.e. the Clinician in respect of the patients, if it becomes apparent that the participant is experiencing low mood or memory difficulties. This is particularly important for the Control Group.
g) A sentence should be added at an appropriate place to state that the data for a control subject may be transferred to the depressed group.
h) At 'If something goes wrong' a sentence should be added stating that the NHS Complaints system is available and how to make contact.

2) The Consent Forms require to be amended as follows:

a) Contact details should be at the beginning
b) The version and date of the PIS should be changed at statement 1 to reflect the revised version.
c) Statement 6 should include a sentence stating that all quotes used will be anonymous

You should notify the REC in writing once all conditions have been met (except for site approvals from host organisations) and provide copies of any revised documentation with updated version numbers. The REC will acknowledge receipt and provide a final list of the approved documentation for the study, which can be made available to host organisations to facilitate their permission for the study. Failure to provide the final versions to the REC may cause delay in obtaining permissions.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

Management permission ("R&D approval") should be sought from all NHS organisations

involved in the study in accordance with NHS research governance arrangements.

Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk.

Where a NHS organisation's role in the study is limited to identifying and referring potential participants to research sites ("participant identification centre"), guidance should be sought from the R&D office on the information it requires to give permission for this activity.

For non-NHS sites, site management permission should be obtained in accordance with the procedures of the relevant host organisation.

Sponsors are not required to notify the Committee of approvals from host organisations

Registration of Clinical Trials

All clinical trials (defined as the first four categories on the IRAS filter page) must be registered on a publically accessible database within 6 weeks of recruitment of the first participant (for medical device studies, within the timeline determined by the current registration and publication trees).

There is no requirement to separately notify the REC but you should do so at the earliest opportunity e.g when submitting an amendment. We will audit the registration details as part of the annual progress reporting process.

To ensure transparency in research, we strongly recommend that all research is registered but for non clinical trials this is not currently mandatory.

If a sponsor wishes to contest the need for registration they should contact Catherine Blewett (catherineblewett@nhs.net), the HRA does not, however, expect exceptions to be made. Guidance on where to register is provided within IRAS.

It is responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The documents reviewed and approved at the meeting were:

Document	*Version*	*Date*
Investigator CV		
Letter from Sponsor		23 September 2013
Other: CV for Professor Davidson (Supervisor)		
Participant Consent Form	1	October 2013
Participant Information Sheet: Experimental	1	September 2013
Participant Information Sheet: Control	1	September 2013
Protocol	2	16 August 2013
Questionnaire: Autobiographical Memory Test		

Questionnaire: Random number generation task		
Questionnaire: Educational & Medical Questionnaire	1.0	Sept 2013
Questionnaire: Montreal Cognitive Assessment		
Questionnaire: Trial Making Test		
Questionnaire: STROOP (D-KEFS Color-Word Interference Test		
Questionnaire: HADS		
Questionnaire: TOPF		
REC application		26 September 2013
Referees or other scientific critique report		24 September 2013

Membership of the Committee

The members of the Ethics Committee who were present at the meeting are listed on the attached sheet.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Reporting requirements

The attached document "After ethical review – guidance for researchers" gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

Notifying substantial amendments
Adding new sites and investigators
Notification of serious breaches of the protocol Progress and safety reports
Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

Feedback

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

Further information is available at National Research Ethics Service website > After Review

13/WS/0268	**Please quote this number on all correspondence**

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at http://www.hra.nhs.uk/hra-training/

With the Committee's best wishes for the success of this project.

Yours sincerely

for
Dr Gregory Ofili
Chair

Enclosures: List of names and professions of members who were present at the meeting and those who submitted written comments
"After ethical review – guidance for researchers"

Copy to: Professor Kate Davidson, University of Glasgow
Mr R Hamill, NHS Lanarkshire

West of Scotland REC 5

Attendance at Committee meeting on 16 October 2013

Committee Members:

Name	*Profession*	*Present*	*Notes*
Professor Pauline Banks	Reader (Older Persons' Health)	No	
Dr Stewart Campbell	Consultant Physician & Gastroenterologist	No	
Dr James Curran	GP	Yes	
Dr Judith Godden	Scientific Officer/Manager	No	
Dr Darryl Gunson	Lecturer	No	
Dr Gillian Harold	Consultant Radiologist	Yes	
Dr Ahmed Khan	Consultant Psychiatrist	Yes	
Mrs Sharon Macgregor	Co-ordinator	No	
Professor Eddie McKenzie	Statistician	Yes	
Canon Matt McManus	Parish Priest	Yes	
Ms Janis Munro	Key Account Manager	Yes	
Dr Gregory Ofili (CHAIR)	Consultant Gynaecologist	Yes	
Mrs June Russell	Retired (Research Chemist)	Yes	
Mr Charles Sargent	Retired	No	
Dr Bill Smith	Consultant Physician	Yes	
Mrs Liz Tregonning	Retired (Special Needs Teacher)	Yes	

Also in attendance:

Name	*Position (or reason for attending)*
Ms Evelyn Jackson	Co-ordinator
Mrs Liz Jamieson	Committee Co-ordinator

Appendix 3.4 : Ethics Committee Letter of Approval II

NHS
Greater Glasgow and Clyde

WoSRES
West of Scotland Research Ethics Service

West of Scotland REC 5
Ground Floor - Tennent Building
Western Infirmary
38 Church Street
Glasgow
G11 6NT

Mrs Deirdre Burns
xxxxxxxxxxxx
xxxxxxxx
xxx

Date 26 November 2013

Direct line 0141 211 2102
E-mail WoSREC5@ggc.scot.nhs.uk

Dear Mrs Burns

Study title: **Over general memory in a depressed older adult population: the role of executive functioning**
REC reference: **13/WS/0268**
IRAS project ID: **137120**

Thank you for your letter of 13 November 2013 . I can confirm the REC has received the documents listed below and that these comply with the approval conditions detailed in our letter dated 29 October 2013

Documents received

The documents received were as follows:

Document	*Version*	*Date*
Covering Letter		13 November 2013
Participant Consent Form	2.0	November 2013
Participant Information Sheet: Experimental	2.0	November 2013
Participant Information Sheet: Control	2.0	November 2013

Approved documents

The final list of approved documentation for the study is therefore as follows:

Document	*Version*	*Date*
Covering Letter		13 November 2013
Investigator CV		
Letter from Sponsor		23 September 2013
Other: CV for Professor Davidson (Supervisor)		

Participant Consent Form	2.0	November 2013
Participant Information Sheet: Experimental	2.0	November 2013
Participant Information Sheet: Control	2.0	November 2013
Protocol	2	16 August 2013
Questionnaire: Autobiographical Memory Test		
Questionnaire: Random number generation task		
Questionnaire: Educational & Medical Questionnaire	1.0	Sept 2013
Questionnaire: Montreal Cognitive Assessment		
Questionnaire: Trial Making Test		
Questionnaire: STROOP (D-KEFS Color-Word Interference Test		
Questionnaire: HADS		
Questionnaire: TOPF		
REC application		26 September 2013
Referees or other scientific critique report		24 September 2013

You should ensure that the sponsor has a copy of the final documentation for the study. It is the sponsor's responsibility to ensure that the documentation is made available to R&D offices at all participating sites.

13/WS/0268 Please quote this number on all correspondence

Yours sincerely

Mrs Sharon Macgregor
Committee Co-ordinator

Copy to: Professor Kate Davidson, University of Glasgow
Raymond Hamill, NHS Lanarkshire

Appendix 3.5 : Research and Development Letter of Approval

NHS Lanarkshire Research & Development: Amendment Approval Letter Project I.D. Number L13096

Mrs Deirdre Burns
Trainee Clinical Psychologist
xxxxxxxxxxx
xxxxxx
xxxxx

R&D Department
Corporate Services Building
Monklands Hospital
Monkscourt Avenue
AIRDRIE
ML6 0JS

Date 19 December 2013
Enquiries to Lorraine Windsor,
R&D Facilitator
Direct Line 01236 712459
Email Lorraine.Windsor@lanarkshire.scot.nhs.uk

Dear Mrs Burns,

Project title: Over general memory in a depressed older adult population: the role of executive functioning

R&D ID: L13096

I am writing to you as Chief Investigator of the above study to advise that R&D Management approval has been granted for the conduct of your study within NHS Lanarkshire as detailed below:

NAME	TITLE	ROLE	NHSL SITE TO WHICH APPROVAL APPLIES
Mrs Deirdre Burns	Trainee Clinical Psychologist	Chief Investigator	Coathill Hospital and Harry Walker Centre

As you are aware, NHS Lanarkshire has agreed to be the Sponsor for your study. On its behalf, the R&D Department has a number of responsibilities; these include ensuring that you understand your own role as Chief Investigator of this study. To help with this we have outlined the responsibilities of the Chief Investigator in the attached document for you information.

All research projects within NHS Lanarkshire will be subject to annual audit via a questionnaire that we will ask you to complete. In addition, we are required to carry out formal monitoring of a proportion of projects, in particular those projects that are Sponsored by NHS Lanarkshire. In either case, you will find it helpful to maintain a well organised Site File. You may find it helpful to use the folder that we have included for that purpose.

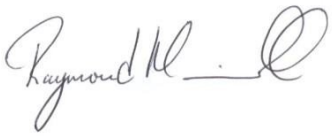
NHS Lanarkshire Research & Development: Amendment Approval Letter Project I.D. L13096

For the study to be carried out you are subject to the following conditions:

- You are required to comply with Good Clinical Practice, Ethics Guidelines, Health & Safety Act 1999 and the Data Protection Act 1998.
- The research is carried out in accordance with the Scottish Executive's Research Governance Framework for Health and Community Care (copy available via the Chief Scientist Office website: http://www.show.scot.nhs.uk/cso/ or the Research & Development Intranet site: http://firstport/sites/randd/default.aspx.
- You must ensure that all confidential information is maintained in secure storage. You are further obligated under this agreement to report to the NHS Lanarkshire Data Protection Office and the Research & Development Office infringements, either by accident or otherwise, which constitutes a breach of confidentiality.
- Clinical trial agreements (if applicable), or any other agreements in relation to the study, have been signed off by all relevant signatories.
- You must contact the R&D Department if/when the project is subject to any minor or substantial amendments so that these can be appropriately assessed, and approved, where necessary.
- You notify the R&D Department if any additional researchers become involved in the project within NHS Lanarkshire
- You notify the R&D Department when you have completed your research, or if you decide to terminate it prematurely.
- You must send brief annual reports followed by a final report and summary to the R&D office in hard copy and electronic formats as well as any publications.
- If the research involves any investigators who are not employed by NHS Lanarkshire, but who will be dealing with NHS Lanarkshire patients, there may be a requirement for an SCRO check and occupational health assessment. If this is the case then please contact the R&D Department to make arrangements for this to be undertaken and an honorary contract issued.

I trust these conditions are acceptable to you.

Yours sincerely,



Raymond Hamill – Corporate R&D Manager

c.c.

NAME	TITLE	CONTACT ADDRESS	ROLE
Raymond Hamill	R & D Manager	Corporate Services, Monklands Hospital	Sponsor Contact
Professor Kate Davidson	Director GISPI	Institute of Health and Wellbeing, University of Glasgow	Named Contact
Dr Clive Ferenbach	Clinical psychologist	Coathill hospital, Coatbridge	Local Contact

Enc 1 x Site File
1 x Responsibilities as Sponsor Notes

Appendix 3.6 : Major Research Project Proposal

Abstract

Background - Depression is a common presenting problem for Older Adults (OA) and amongst those using psychology services in the UK today. Certain psychological variables have been found to be associated with a vulnerability to depression with Over General Memory (OGM) one of them. Recently a new executive functioning deficits hypothesis has been put forward to understand why OGM exists. Despite some recent studies within child and adult populations, there has been very limited research into the older adult population (a population that is known to exhibit greater executive functioning deficits), and to date no study has investigated this hypothesis within a clinical sample of older adults.

Aims - To investigate the evidence for the executive functioning hypothesis of OGM within a depressed older adult population.

Methods - depressed and non depressed older adults (age 65+) will complete specific neuropsychological tests to determine their executive functioning (three sub-categories as outlined in Miyake's (2000) model of executive control) and the Autobiographical Memory Test to determine their level of OGM recall. Results will be analysed using t-tests and partial correlation to determine if/how EF deficits account for OGM within this depressed population

Applications - inform clinical practice through a greater understanding of the psychological and neurological risk factors for depression within the OA population and help shape/tailor intervention for those with depression or at risk of developing it, for example, Executive Functioning training.

Contents

Introduction

Depression is a common presenting problem for Older Adults (OA) (Kvaal, McDougall, Brayne, Matthews, and Dewey, 2008) and amongst those using psychology services in the UK today. Past research has focused on why this is, including investigating social, physical and psychological reasons in order to inform and shape appropriate intervention within this age group (Hawton, Green, Dickens, Richards, Taylor, Edwards, Greaves and Campbell, 2011, Hatfield, Hirsch and Lyness, 2013, Vanderhorst and McLaren, 2005 and Dozeman, van Marwijk, van Schaik, Stek, van der Horst, Beekman, and van Hout, 2010). Also worth noting is that the UK has an ever aging population with an increasing number of people living into old age (Lutz, Sanderson and Scherbov, 2008) which may indicate an increase in the number of older adults developing depression and using health services in the near future.

Over General Memory (OGM) and Depression

It is well documented in psychological literature that certain psychological variables are associated with a vulnerability to depression (e.g. hopelessness, Conaghan and Davidson, 2002 and poor interpersonal problem solving, Gibbs, Dombrovski, Morse, Siegle, Houck and Szanto, 2009). Over General Memory (OGM) has also been found to be linked to depression (Puffet, 1991, Kuyken and Dalgleish, 1995, van Vreewijk and de Wilde, 2004) and in taking longer to recover from depression (Raes, Hermans, Williams, Beyers, Brunfaut and Eelen, 2006). OGM is understood as the phenomenon of producing less specific/more generalised responses than others when asked to give a specific autobiographical memory (AM) (Williams, Barnhofer, Chrane, Hermans, Raes and Watkins, 2007). For example, on the Autobiographical Memory Test (AMT – Williams and Broadbent, 1986) where one is required to retrieve a specific discrete personal memory in response to a cue word (e.g. summer), an individual with OGM would respond more frequently with categorical memories (e.g. “I enjoyed all my childhood summer holidays”), than the required specific episodic memories (e.g. “When a seagull stole my ice-cream as I was walking along Brighton pier last summer ”) . It is proposed that AM functions as a process where after being cued, individuals initially start

searching their memory at a general level (by categorical memories) then cued by these, generate more specific episodic memories.

Theories of OGM

More recently work has been conducted that attempts to understand the factors that contribute to OGM. There are currently three theories that have been investigated.

.

The 'Affect Regulation' of 'Functional Avoidance' (Williams, 1996) Hypothesis states that OGM is a consequence of cognitive avoidance. In essence, those with depression engage in cognitive avoidance as a coping mechanism, allowing them to avoid painful specific personal memories from the past. This cognitive avoidance gives rise to a non-specific retrieval style which does not allow for recall of specific personal events and generates more OG memories.

The 'Rumination' Hypothesis (Williams, 2007) proposes that during depression, rumination interferes with memory searches. Individuals with depression have highly activated negative self-representations that during memory searches cause the individual to become 'captured' at the *general* stage of self-representation where they negatively ruminate about the self, rather than progressing to a specific memory, thus producing over general memories.

More recently the 'Executive Control' hypothesis has been put forward stating that Executive Functioning deficits could be impairing the ability of an individual to remember specific episodic memories (Dalgeish, Williams, Golden, Perkins, Barrett, Barnard, Au Yeung, Murphy, Elward, Tchanturia and Watkins, 2007, Holland, Ridout, Walford and Geraghty, 2012, and Piolino, Coste, Martinelli, Mace, Quinette, Guillery-Girard and Belleville, 2010). The concept of executive functioning encompasses a wide range of cognitive abilities but can be generally thought of as a set of abilities required to guide goal oriented behaviour, especially in novel situations. Miyake, Friedman, Emerson, Witzki and Howerter (2000) classified executive functioning into three subcomponents: inhibition, shifting and updating/monitoring. Little is known about

which Executive Functioning processes or subcomponents might influence OGM, although recent research has suggested that there may be some relationships.

INHIBITION

(The ability to deliberately inhibit dominant, automatic or prepotent responses when necessary - Miyake et al 2000)

In his series of studies published in 2007 Dalgleish postulated that OGM may arise from the inability to inhibit interference from irrelevant information activated during the search for a specific memory. He found that individuals who displayed more 'task errors' on a wide range of EF tests were also found to have had more OGM's on the AMT, it was suggested that this could indicate poorer inhibition as individuals were unable to inhibit irrelevant information generated early during memory retrieval. For example, an impaired ability to inhibit the memories that are generated at the start of a memory search may result in the search ceasing at this more general level without the person ever 'getting to' the more discrete personal memories, thus producing more OGMs. Indeed Raes et al 2010 found that lower inhibition in a community group of children mediated the association between depressive symptoms and OGM (using a self-report measure of inhibition) and Piolino et al (2010) found that age related decreases in level of specificity of autobiographical memories was mediated by participants performance on executive function tests that measure inhibition. However, in contrast Valentino, Bridgett, Hayden and Nuttall (2012) did not find inhibition to be associated with OGM in a psychiatric sample of children and adolescents nor did Holland et al (2012) in a non-clinical sample of older adults.

SHIFTING

(The ability to shift back and forth between multiple tasks, operations or mental sets – Monsell, 1996 in Miyake et al, 2000)

Cognitive 'shifting' is important to consider with respect to OGM due to the conceptual relation between the inability to shift mental set (ie. Rumination) and over-generality

(Williams et al , 2007). This is especially important to consider within a depressed population, as rumination has been shown to be related to depressive symptoms (for a recent review, see Nolen-Hoeksema, 2004) . However despite this, Valentino et al (2012) recent study is the only one to date to consider 'shifting' in relation to OGM. They did not find a relationship between 'shifting' ability and OGM in a population child and adolescent inpatients.

UPDATING

(updating and monitoring of working memory representations – Miyake et al, 2000)

Updating working memory with newly generated memories, monitoring progress through the memory search and verifying new memories to see if they meet eligibility are all crucial aspects in order to progress from general to specific memories. Holland et al (2012) found that updating rather than inhibition was the source of age related reduction in AM specificity in a non-clinical sample of older adults. In addition Piolino et al (2009) also found updating mediated the increase in age-related increase in level of specificity of autobiographical memory.

As is evident, there has been limited research conducted in this area to date, with some studies having methodical limitations (e.g. using self report measures rather than neuropsychological tests). The recent study by Valentino et al (2012) was the first to investigate all three subcomponents of Executive Functioning and this was within a psychiatric population of children and adolescents.

OLDER ADULT

The EF hypothesis could be potentially particularly important to consider within the older adult population as it has been widely accepted that EF, and in particular abilities to inhibit, decrease with age. As mentioned above the relatively new area of the EF hypothesis for OGM has been not widely researched yet, although there have been some studies: in the adult (Dalgleish, 2007) and child (Raes et al, 2010 and Valentino et al 2012) depressed populations, and three studies have examined non clinical populations,

Sumner et al (2011 – adult), and Holland et al (2012) and Piolino et al (2009) (both comparisons between older and younger adults). The EF hypothesis has yet to be studied in an OA clinical population.

It is therefore proposed to investigate the executive control hypothesis of OGM (all three subcategories, shifting, updating/monitoring and inhibition) within a depressed older adult population.

Aims and Hypothesis

Aim

- To investigate the evidence for the executive functioning hypothesis of OGM (all subcategories) within a depressed older adult population.

Hypothesis

- Hypothesis 1 –in older adults, those with depression will have more over general memories than those without depression.
- Hypothesis 2 – those with more over general memories will have greater impairment in executive functioning abilities.
- Hypothesis 3 – The strength of the relationship between depression and over general memories will be reduced when controlling for executive functioning abilities.

Plan of Investigations

Participants

Depressed older adults and Non-depressed older adults

Inclusion and Exclusion criteria

Inclusion

- Depressed group - Adults over 65 years of age who are currently known to a community mental health team, whose main presenting problem is Depression

and who score within the clinical range for Depression on the Hosptial Anxiety and Depression Scale (HADS).

- Control group – Adults over 65 years of age who are not currently being treated for depression or any other mental health problem, and score out with the clinical range for Depression on the HADS.

Exclusion – Those with a diagnosed cognitive degenerative disease (e.g. dementia, Parkinson's etc), or those with mild cognitive impairment as shown on the Montreal Cognitive Assessment (MOCA). Those who have experienced ahead injury, or aStroke in the past will also be excluded, as will those on cognitive enhancer medication.

Recruitment Procedures

- Recruitment for the Depressed group will be from all older adult community mental health teams across NHS Lanarkshire. Potential participants will initially be selected from individual mental health clinician's caseloads based on meeting the inclusion criteria above. They will be approached by their named clinician indicating that they are eligible to participate in this research study and given the patient information sheet to consult. Recruitment to the Control group (non-depressed) will be from older adult community groups across Lanarkshire. The researcher will contact the facilitators of these groups and attend a group session to talk with group attendees about participating in the study. They also will be provided with patient information leaflets.
- Participants can indicated their willingness to hear more about the study from the researcher by telephoning the number on the information sheet, or by letting their named health professional, or group facilitator in the case of the control group, know they would like to participate when they next see them.
- In the case of the Depressed group, willing participants will be given a time to come to a local NHS building to formally consent to the study and complete the testing procedures. For the control group the researcher will arrange a time to come to the community groups normal meeting venue to formally consent to the study and test those willing to participate in the study.

Measures

Depression

Hospital Anxiety and Depression Scale (HADS – Zigmond and Snaith, 1983).

Over General Memory (OGM)

Autobiographical Memory Test (AMT – Williams and Broadbent, 1986).
The AMT as described by Kuyken and Dalgleish (1995), 10 emotional words (five pleasant and five unpleasant) are used to cue memories and are presented in a random order. Participants are given 1 minute to come up with an autobiographical memory (specific time and place when something happened to them) that should be something that happened at a particular time on a particular day (i.e. lasting less than a day). Their responses will be recorded on a digital voice recorder for later categorising and scoring purposes.

Executive control:

- **Shifting**
  Delis-Kaplan Executive Function System (D-KEFS, Delis, Kaplan and Kramer, 2001) – Trails subset
- **Inhibition**
  Stroop Colour-Word test (Stroop, 1935)
- **Updating**
  Random Number Generation Test (RNG) (as used in Holland et al, 2012)

Speed of Processing

D-KEFS Trails subset – Trail A will be used to determine speed of processing.

Design and Research Procedures

Design

2 group design (independent)

Procedure

Screening process

- All participants will complete a short questionnaire including questioning regarding age, educational history and brief medical history. This should allow the researcher to identify if any participants meet any of the exclusion criteria. Those who do not will continue with the screening procedure.
- For Depressed group - Participants will then complete the HADS with all those scoring within the clinical range for depression going on to complete the rest of the screening procedure.
- For the Control group – Participants will complete the HADS with all those out with the clinical range for depression going on to complete the rest of the screening procedure.
- To screen for General Cognitive Impairment those still eligible after completing the HADS will complete the MOCA. Those that meet the cut-off for inclusion will then complete the testing procedures as outlined below.

Testing procedure

The tests will be administered in the following sequence for all participants: Test Of Pre-morbid Functioning (TOPF), AMT; RNG; D-KEFS (trails) and the Stroop Colour-Word test. The testing procedure should take approximately 60-75 minutes per participant. All participant testing will be carried out by the sole researcher for this project.

Data Analysis

Assuming that scores will be normally distributed, differences in scores on the AMT, HADS and the three EF tests between the groups will be assessed by t-tests. If a significant difference is found between the two groups with respect to OGM, then a partial correlation calculation will be carried out to determine if the relationships can, in part, be accounted for by executive functioning abilities.

Justification of sample size

Justification of sample size is based on the Effect sizes of previous studies following two lines of research:

- Studies that have investigated Overgeneral memory in Depressed versus Non Depressed populations

Recent studies such as Birch and Davidson (2007) and Ricarte et al (2011) investigated OGM in depressed Older adult populations and found large effect sizes (0.86 and 0.78 respectively), and there have been similar studies in the adult population that have found very large effect sizes (Wessel et al, 2001 – ES = 1.2).

- Studies that have investigated Executive Functioning in Depressed versus Non Depressed populations

A recent study looking at executive functioning in a depressed older adult population found very large effect sizes (Lockwood et al, 2002), including using some of the tests that this study proposes to use (e.g. Stroop test – ES = 1.29 and D-KEFS Trails test – ES = 1.54). A recently published review of executive functioning and major depressive disorder by Synder (2013) found medium to large effect sizes (e.g. Stroop test – ES = 0.73 and D-KEFS Trails test – ES = 0.59.

Based on these findings I propose to expect to find a large effect size in my study, as I am using similar methodology (especially in relation to the Birch and Davidson, 2007 study), participant groups and measures as the studies mentioned above.
Using G* Power 3 tool it is estimated that I will require 21 participants per group (N = 42) to allow for 0.8 power in this study ($\alpha = 0.05$, Effect Size (d) = 0.8*)
*Effect Size based on estimates from Cohen (1988) where large effect sizes are estimated at d = 0.8

Settings and Equipment

- Clinic rooms in NHS Lanarkshire health buildings across Lanarkshire.
- Measures as outlined above (see 'Measures' section) including Executive functioning neuropsychological tests, MOCA, TOPF, HADS and AMT.
- Digital voice recorder
- Laptop computer with appropriate software

Health and Safety Issues

Researcher Safety Issues

Lone working – adhere to local NHS policy. No home visits.

Sensitive material may arise during HADS questionnaire (for example suicidal ideation) – researcher to use supervision with field supervisor to discuss these issues.

Participant Safety Issues

Risk issues may arise re: suicide ideation and risk to self (participant) – be aware of the Lanarkshire Suicide Assessment and Treatment Pathway, including relevant telephone numbers (such as Samaritans), and check all HADS high scores while with the participant to aid identification of 'risk'. In addition to this, all participants with be known to a CMHT and so will have a named mental health clinician (for example, Psychologist, psychiatrist, community nurse etc.). Any concerns regarding risk will be highlighted to the participants named mental health professional by letter and if urgent also by telephone.

Ethical Issues

- Individuals recruited will be depressed and therefore might find the testing procedure stressful (see above, 'Participant Safety Issues' for how this will be managed).
- Individuals will fill out a HADS questionnaire prior to completing any of the other testing:
    - It may transpire that a participant will not meet the cut-off score for Depression as measured for by the HADS or the MOCA. If this situation occurs it is proposed that the individual is thanked for their participation in the study but will not complete any further testing – this is to ensure no un-necessary testing takes place.
    - It may transpire that a participant scores very highly on the HADS. If this situation occurs it is proposed that their named mental health clinician is contacted to inform them of this by standard letter. The researcher will

also be available to discuss this with the named clinician via telephone if required.

- It may transpire that a participant scores beyond the cut off for the MOCA which may indicate general cognitive impairment, or the early stages of dementia. If this situation occurs it is proposed that the researcher will inform the participant of this, and inform them of where to obtain further information if they wish so (e.g. speak to GP, their named mental health clinician etc).

- Application for R&D permission and Ethical approval will be made at the same time through the Integrated Research Application System (IRAS).

Financial issues

- Psychometric tests – May be held by department (Older Adult Psychology Lanarkshire) – No Cost
- Psychometric recording sheets will need to be purchased
- Voice recorder for recording answers to AMT for scoring will be requested to borrow from the university.
- Travel costs for researcher to travel to clinics for testing participants.
- Photocopying/Printing costs per participant for patient information leaflet etc

Timetable

Spring 2013 – Submit Proposal to University

Spring/Summer 2013 – Apply for ethical approval

Autumn/winter 2013

- Conduct Literature Review
- Contact services (and disseminate information) regarding the recruitment of participants to the study.
- Compile participant testing packs

Winter 2013 – Spring 2014 - Recruitment and testing of participants

Summer 2014 – analysis, write up and submission

Autumn 2014 – Compile article and submit to selected journal(s)

Practical Applications

- The results of this study will inform clinical practice:
- (a) risk factors - greater understanding of the psychological and neurological risk factors for depression within the OA population

(b) intervention – this knowledge could help shape/tailor intervention for those with depression or at risk of developing it. For example in terms of reducing the impact of EF and OGM deficits by tailoring a therapy around these known deficits or including EF/OGM training in the intervention in order to improve these deficits.

References

- Birch, L.S. and Davidson, K.M (2007) Specificity of autobiographical memory in depressed older adults and its relationship with working memory and IQ. *British Journal of Clinical Psychology*, 46, 175-186.

- Cohen, J. (1988) Statistical power analysis for the behavioural sciences (2nd Ed) Hillsdale, NJ: Erlbaum.

- Conaghan, S. and Davidson, K.M. (2002) Hopelessness and the anticipation of positive and negative future experiences in older parasuicidal adults. *Journal of Clinical Psychology*, 41, 233-243.

- Dalgleish, T., Williams, J.M.G., Golden, A.M.J., Perkins, N., Barrett, L.F., Barnard, P.J., Au Yeung, C., Murphy, V., Elward, R., Tchanturia, K., and Watkins, E. (2007) Reduced Specificity of Autobiographical Memory and Depression: The Role of Executive Control. *Journal of Experimental Psychology: General*, 136, 23-42.

- Delis, D.C., Kaplan, E., and Kramer, J.H. (2001) *Delis-Kaplan Executive Function Systems*. San Antonio: TX: Psychological Corporation

- Dozeman, E., van Marwujk, H.W.J., van Schaik, D.J.F., Stek, M.L., van der Horst, H.E., Beekman, A.T.F., and van Hout, H.P. High incidence of clinically relevant depressive symptoms in vulnerable persons of 75 years or older living in the community. *Aging and Mental Health*, 14, 828-833.

- Gibbs, L.M., Dombrovski, A.Y., Morse, J., Siegle, G.J., Houck, P.R., and Szanto, K. (2009) When the Solution is Part of the Problem: Problem Solving in Elderly Suicide Attempters. *International Journal of Geriatric Psychiatry*, 24, 1396-1404.

- Hatfield, J.P., Hirsch, J.K, and Lyness, J.M. (2013) Functional impairment, illness burden, and depressive symptoms in older adults: does type of social relationship matter? *International Journal of Geriatric Psychiatry*, 28, 190-198.

- Hawton, A., Green, C., Dickens, A., Richards, S., Taylor, R., Edwards, R., Greaves, C., and Campbell, J. (2011) The impact of social isolation on the heath status and heatlh-related quality of life of older people. *Quality of Life Research*, 20, 57-67

- Holland, C.A., Ridout, N., Walford, E., and Geraghty, J. (2012) Executive Function and Emotional Focus in Autobiographical Memory Specificity in Older Adults. *Memory*, 20:8, 779-793

- Kvaal, K., McDougall, F.A., Brayne, C., Matthews, F.E., and Dewey, M.E. (2008)
- Co-occurrence of anxiety and depressive disorders in a community sample of older people: results from the MRC CFAS (Medical Research Council Cognitive Function and Ageing Study) *International Journal of Geriatric Psychiatry*, 23: 229–237.

- Kuyken, W., and Dalgleish, T. (1995) Autobiographical memory and depression. *British Journal of Clinical Psychology*, 34, 89-92.

- Lockwood, K.A., Alexopoulos, G.S., and van Gorp, W.G. (2002) Executive dysfunction in Geriatric Depression. *American Journal of Psychiatry*, 159, 1119-1126,

- Lutz, W., Sanderson, W. And Scherbov, S. (2008) The coming acceleration of global population ageing. *Nature*, 451, 716-719.

- Miyake, A., Friedman, N.P., Emerson, M.J., Witzki, A.H., and Howerter. A. (2000) The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. *Cognitive Psychology*, 41, 49-100.

- Monsell, S. (1996) Control of Mental Processes. IN V.Bruce (Ed.), Unsolved mysteries of the mind: Tutorial essays in cognition (pp. 93-148). Hove, UK: Erlbaum. IN Miyake, A., Friedman, N.P., Emerson, M.J., Witzki, A.H., and Howerter. A. (2000) The Unity and Diversity of Executive Functions and Their Contributions to Complex "Frontal Lobe" Tasks: A Latent Variable Analysis. *Cognitive Psychology*, 41, 49-100.

- Nolen-Hoeksema (2004). Depressive rumination: Nature, theory, and treatment. In C. Papageorgiou, & A. Wells (Eds.), pp. 107–124, Chichester, UK: Wiley.

- Piolino, P., Coste, C., Martinelli, P., Mace, A.L., Quinette, P., Guillery-Girard, B., and Belleville, S. (2010) Reduced specificity of autobiographical memory and aging: Do the executive and feature binding functions of working memory have a role? Neruopsychologica, 48, 429-440

- Puffet, A., Jehin-Marchot, D., Timsit-Berthier, M., and Timsit, M. (1991) Autobiographical Memory and Major Depressive States. European Psychiatry, 6, 141-145.

- Raes, F., Hermans, D., Williams, J.M.G., Beyers, W., Brunfaut, E., and Eelen, P. (2006) Reduced Autobiographical Memory Specificity and Rumination in Predicting the Course of Depression. *Journal of Abnormal Psychology*, 115, 699-704.

- Raes, F., Verstraeten, K., and Bijttebier, P. (2010) Inhibitory control Mediates the Relationship Between Depressed Mood and Overgeneral Memory Recall in Children. *Journal of Clinical Child and Adolescent Psychology*, 39(2), 276-281.

- Ricarte, J.J., Latorre, J.M., Ros, L., Navarro, B., Aguilar, M.J., and Serrano, J.P. (2001) Overgeneral autobiographical memory effect in older depressed adults. *Aging and Mental Health*, 15, 1028- 1037.

- Synder, H.R. (2013) Major Depressive Disorder Is Associated With Broad Impairments on Neuropsychological Measures of Executive Function: A Meta-Analysis and Review. *Psychological Bulletin*, 139, 81-132.

- Stroop, J.R. (1935) Studies of Interference in Serial Verbal Reactions. *Journal of Experimental Psychology*, 18, 643-662.

- Vanderhorst, R.K., and McLaren, S. (2005) Social relationships as predictors of depression and suicidal ideation in older adults. *Aging and Mental Health*, 9, 517-525.

- Van Vreeswijk, M.F., and de Wilde, E.J. (2004) Autobiographical memory specificity, psychopathology, depressed mood and the use of the AMT: a meta analysis. *Behaviour Research and Therapy*, 42, 731-743.

- Valentino, K., Bridgett, D.J., Hayden, L.C., and Nuttall, A.K. (2012) Abuse, Depressive Symptoms, Executive Functioning, and Overgeneral Memory Among a Psychiatric Sample of Children and Adolescents. *Journal of Clinical Child and Adolescent Psychology*, 41(4), 491-498.

- Wessel, I., Merren, M., Peeters, F., Arntz, A. and Merckelbach, H. (2001) Correlates of autobiographical memory specificity: the role of depression, anxiety and childhood trauma. *Behaviour Research and Therapy*, 39, 409-421.
- Williams, J.M.G. and Broadbent, K. (1986) Autobiographical Memory in Suicide Attempters. *Journal of Abnormal Psychology*, 95, 144-149.

- Wiliams, J.M.G. (1996) Depression and the specificity of autobiographical memory. IN D. C. Rebin (Ed.), *Remembering our past: Studies in autobiographical memory (*pp. 244-267). Cambridge, UK: Cambridge University Press.

- Williams, J.M.G., Barnhofer, T., Crane, G., Hermans, D., Raes, F., Watkins, E (2007) Autobiographical memory specificity and emotional disorder. *Psychological Bulletin*, 113, 122-148.

- Zigmond, A. S., and Snaith, R. P. (1893) The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica*, 67, 361-370.